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EDITORIAL.

THIS IS A VERY busy season for hydraulic miners and those who are ground-sluicing and doing other placer work in California. The streams are all full to the banks, and there is an abundant supply of water for washing gravel in all the counties where such mining is being carried on. In the higher ranges the supply of snow stored by the winter storms is quite satisfactory, and, unless warm weather prevails too soon, the water season this coming summer will last longer than has been the case for several years past. Several successive dry seasons have worked much hardship to the gravel miners, whose water supply has lasted only about half the usual time; but the abundant rains which have fallen in the past month have softened the ground, filled the reservoirs and ditches and made the miners happy.

THE EQUIPMENT OF LABORATORIES at technical colleges is a subject which should interest professional men, and a brief abstract of a suggestive paper by Mr. Henry C. Jenkins, which we publish on another page, may serve as a text for discussion. We invite the comment of professors at schools of mines. At the Institution of Mining & Metallurgy in London, where this paper was presented, there was a full discussion, in which representative men took part. Professor Unwin urged that mining men ought to be trained as mechanical engineers, and therefore a school of mines should not be divorced from a college of engineering. Sir Clement Le Neve Foster pointed out that although practical instruction in mine work could not be given in a lecture room, yet there were many subjects, quite distinct from metallurgy, which could be illustrated by laboratory experiments. It was also brought out by the discussion that general opinion sanctioned the practice of professors taking up outside consultative work, as this was the best way of keeping them in practical touch with technical progress, but it was emphasized that such professional work should not include any business involving financial responsibility, the latter being likely to disturb that equanimity which is essential to successful teaching. These are all matters concerning which there is room for latitude of

opinion. We intend to revert to the subject at an early date; in the meanwhile enough has been said to invite discussion from those of our readers, and there are many, who take an interest in technical education.

AMERICAN SHAREHOLDERS in English companies who have had reason to feel the weight of the income tax will sympathize with Messrs. A. Goerz & Company, who have just lost their case against the Surveyor of Taxes. An appeal had been taken against the heavy assessment made by the Income Tax Commissioners who chose to regard the company as resident in London, although it is registered at Pretoria, in the Transvaal, where its mining interests lie, and where the greater part of the company's clerical and technical staff lives. The capital is chiefly foreign, having been raised originally in Germany; the profits are mostly payable at Berlin and Paris, four-fifths of the shareholders and most of the directors are domiciled out of England; but, despite these facts, the company is assessed for £142,000 by the Income Tax Commissioners, and their action has been confirmed because the board of directors met in London during the year in question. The judgment is to be contested before the Supreme Court.

Persons resident in England pay income tax on the whole of their profits, wherever made, unless they prove that no part of their business is carried on within the United Kingdom. The case under discussion applies only to companies which do business out of England, but find it useful to make London their headquarters. In return for taxes they obtain certain facilities and a certain status with the investing public. The question therefore arises; Are these facilities dear at the price levied by the Income Tax Commissioners, and, to what extent would it be sound business for the British government to modify the law in order that it may not become so onerous as to compel companies to transfer their headquarters elsewhere?

THE REPORT OF the Daly-West mine in Utah, given on another page, shows that its output of silver was 4,382,228 oz. in 1903; making it the most important mine in the United States now worked for its silver values chiefly. It is not the largest silver producer, that distinction belonging to the Anaconda mine in Montana, in which, however, the copper has the predominating value. In 1898, the Anaconda produced 5,706,377 oz. silver; since that year, we have no means of ascertaining its exact output, though it has probably decreased slightly. The entire production of the Coeur d'Alene district, in Idaho, last year was 5,500,000 oz. silver, or only about a million ounces more than that of the Daly-West. In addition to their silver, the ores produced by this mine last year contained 34,742,703 lb. of lead, 22,573,355 lb. zinc and 4,322,222 lb. copper; lead being the chief base metal content. The silver was accompanied by 3,105 oz. gold. The Anaconda silver product, given above, was obtained in connection with 135,002,147 lb. copper, and 19,130 oz. gold. The report shows that the Daly-West is entitled to rank as one of the great silver mines of the world. In fact, it approaches the Broken Hill Proprietary, usually considered the leader in this department of mining, which reported last year, 5,217,327 oz. silver. The Broken Hill, however, goes far ahead in lead, its output having been 65,551 tons, or nearly four times that of the Daly-West.

EQUIPMENT AND ORE RESERVES.

We take particular pleasure in publishing an article by Mr. H. C. Hoover on so important a matter as the economic ratio between the capacity of the reduction works of a mine and the tonnage of its ore reserves. As a basis for argument Mr. Hoover has assumed the existence of a plant, and proceeds therefrom to discuss the additions to it which are warranted by an increase in the amount of ore available for treatment. There are thus two problems; first, what size of mill to start with, and then, what additions to make as the mine grows.

In most cases the plant is started with an economic unit, which in California is usually a 40-stamp mill, while at Johannesburg it is a 200-stamp mill. We do not know that this is reasoned out further than that the capacity is based roughly upon the amount of ore which can be opened up in the course of ordinary development; that is, the mill is expected to exhaust the existing stoping area about as fast as new ore-reserves are opened up, so that the original tonnage available, equivalent to a two or three years' supply, is maintained until such time as development is unsuccessful, and the mine begins to show exhaustion; then the reserves in hand are used up during a further period of exploratory work. A mill is not erected of such a size as to consume all the ore in one year, for example, because the initial supply generally represents the result of several years' development, and to start out at such a gait would shortly end in the necessity of shutting down part of the plant. In the West it is not uncommon to base the mill-capacity upon the amount of ore to be extracted from one 'lift,' that is, the tonnage stoped between two successive levels one hundred feet apart; it being the experience that to open up one lower level per annum, while consuming the reserves of one upper level, represents a scale of working which is comfortable. However, in ordinary vein mining all such methods indicate an unspoken recognition of the fact that each deeper level brings the mine nearer to the horizon of eventual impoverishment, while on the Rand the limit set to exploitation by the area of the claims affords a less vague, but even more certain, termination to the winning of ore.

Having a certain equipment to start operations, what addition to it is warranted when increased ore-reserves are created in the course of successful development? That is Mr. Hoover's question, which he himself answers. It can be stated also thus: An increase in the mill is justified when the redemption of the capital involved, plus interest upon it, can be more than balanced by the saving in cost or the "increment of profit," upon the additional tonnage taken from new ore reserves. The subject can be treated by differential calculus, and from a mathematical point of view it might well serve as a thesis for advanced students at our schools of mines. From the standpoint of financial experience and practical mining it affords room for a discussion which is well worthy of the best consulting engineers in the profession. We commend it to their earnest consideration.

METAL PRICES.

As the readers of the ENGINEERING AND MINING JOURNAL know, its market reports for many years have given each week the current prices of metals on the New York and the London markets. These reports have, we are pleased to know, met with general acceptance; and this knowledge has been an additional motive to greater care in preparing and presenting them.

From time to time, however, some questions have arisen as to differences between our statements of prices and those sent out by telegraph from New York, and generally known as the Western Union prices. The matter has been referred to on various occasions in our columns; but the receipt recently of several letters on this point makes the present seem an opportune time for a few words.

There is in New York no standard for current quotations, such as is found in the metal exchanges of London and Frankfort, where sales are made and quotations fixed, very much as prices of stocks are made upon the New York Stock Exchange. The New York Metal Exchange, unfortunately, has never secured any standing in the trade. The volume of business done there is small; actual buyers do not resort to it and its quotations have never carried the weight of authority. The only way, therefore, to give prices correctly is to base them upon actual transactions, the record of which can be obtained. This is the course which has been followed by the JOURNAL, and which has, we believe, enabled it to give a record of the metal markets for many years, which has been, in the main, correct.

We say "in the main," because no man can always avoid mistakes; but in every case where it could be proved that a mistake had been made, the JOURNAL has always been ready to acknowledge and correct it, as its readers know. Moreover, we may be permitted to say, the general use and acceptance of our quotations has imposed upon those who make them a deep sense of responsibility; a knowledge that they stand between buyer and seller, between miner and smelter; and a determination to hold the balance evenly and to do the fullest justice to both sides.

A word upon the basis of quotations may be in place here. To be correct, they should be given on a uniform basis, and for that we have always taken the net cash price for New York

delivery, in large quantities. No allowances are made for commissions, freights, time payments and the like. The reasons for this are, or should be, plain. The moment such allowances are made, one embarks on a sea of uncertainties. Questions of interest, credit and the like are involved, which it is impossible to adjust without going into details, which are seldom accessible to the outsider. The only way is to adhere strictly to the positive basis indicated above.

The so-called telegraph, or Western Union, quotations, to which reference has been made, are brokers' quotations entirely, and naturally take account of commissions and, perhaps, other allowances. We do not intend to say that those who furnish them deliberately misrepresent the market. Probably they have no such intention, but they are misled by the difficulty to which we alluded in the last paragraph.

It may sometimes happen that sales are made at exceptional prices, from special causes, and such sales are very apt to appear in the despatches. For instance, at the time of the floods in and about St. Louis last year, deliveries of lead and spelter from the Missouri smelters were much delayed, and therefore spot metal commanded premiums from some manufacturers whose stocks had been unexpectedly exhausted. Sales made in this way, however, were not large in quantity, and could hardly be taken as establishing the general market price. Such cases were closely parallel to those in the iron market during the boom of 1902-3, when premiums were frequently paid to secure early deliveries, but did not affect contract prices or futures.

The New York market, it may be fairly said, makes itself. The time has long gone by when the price of copper here, for instance, was based upon the London quotation, with a certain allowance for freights. We do not mean to say that the foreign markets have no influence upon ours, for the demand for export, in copper especially, cannot fail to have its effect upon conditions here. We do mean, however, that prices are made here, and not in London, as they were fifteen years ago. This is only natural, since the United States is by far the largest producer of copper, while it consumes at home practically all of its output of lead and spelter.

We believe that prices of metals are now nearly on a fair basis—that is, controlled by the actual conditions of supply and demand, and not seriously affected by speculation. The exception, of course, is tin; the small volume of output and the circumstances of its production make that metal subject to frequent and great fluctuations. A constant speculation has been carried on in this metal by English, Dutch and, lately by Chinese operators; and this state of affairs is very likely to continue. The staple metals of construction, however, are on a different and much better basis.

We have made this statement only for the satisfaction of certain of our readers who have asked for information; not because we think that our reports require any special defence. Long use and general acceptance are the best evidence of their accuracy.

NO STRIKE.

The referendum vote, on accepting or rejecting the ultimatum of the bituminous operators, was cast on March 15 by the United Mine Workers; the result has been made known and the two years' scale has been signed. Out of a total of 165,887 votes, 67,373 were for the strike and 98,514 against it, or about 40 per cent Aye and 60 per cent No. That the vote so strongly favored work, as against idleness, is not surprising. As we have pointed out, the real interests of the miners called for the acceptance of the operators' terms. The only question was, whether a sense of power through union, and the work done by paid emissaries of exploiters of social unrest, would sway a majority of the miners against that sober judgment which comes with reflection. In this victory for common sense, President Mitchell is entitled to full credit for pointing out how foolish, under existing industrial conditions, would be a strike in opposition to a reduction of 5.5 per cent from the highest scale ever paid by the operators. It nowise lessens the credit due him that he told the men that by accepting the pending offer of a two years' agreement, the miners would put themselves in a very strong position for united action with the anthracite miners when their agreement expires. A good general tries to fight the enemy on ground of his own choosing, and President Mitchell has made it plain that the contest, which will show just how much unionism has justified its existence in the coal mining regions of Pennsylvania and the central West, is postponed to allow of further manouvering. Every right-minded man will thank him for this, however, since by the postponement, questions of high economic importance will not be dragged through the mud of a political campaign.

MARKET CONDITIONS.

March 23.

The markets are generally firmer, and there is a better sentiment beginning to be apparent.

Copper is stronger, and home consumers are showing increased interest in the market. Manufacturers' stocks are generally rather low, and the necessity for replenishing them begins to be felt. Business abroad continues on a very large scale, and, as we noted last week, the exports for the current month will reach 20,000 tons. It is noticeable that most of the orders now being received from abroad are for early deliveries, indicating a pressing need of the metal.

Tin is again higher, and the Chinese speculators, who at present hold the foreign market, seem determined to continue. An increased consumption here is indicated by the proposed re-opening of mills and the reduction of wages accepted by the tin-plate workers.

Lead continues unchanged, with a good consumption evident. The foreign market is again higher.

Spelter remains firm, and the demand from galvanizers continues very good.

Silver is unchanged and rather quiet. The market is still sensitive, but nothing has occurred to disturb it.

Increased firmness is shown in our reports of the iron and steel markets. The trade is evidently broadening, and though it is still somewhat uneven, prospects are better, and prices generally firmer.

The Western coal trade is somewhat demoralized by delays in railroad traffic, and is dull at most of the large distributing points. General satisfaction is felt at the settlement of the wage discussion.

The seaboard bituminous trade shows little change. The railroads still give slow transportation, and the tonnage of coal arriving at tidewater is insufficient to meet the demand.

In the anthracite trade, quiet prevails. It is fairly certain that a discount of 50c. a ton will be made April 1; in the meantime business is light.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The normal price of a metal may be defined as the price which will induce a steady increase in production, and also a reasonable amount of expenditure in discovering and developing new deposits.

Salt is one of the most widely distributed minerals of economic importance. Fully one-fifth of the world's supply comes from the United States, principally from the brine wells in Michigan and New York. In 1902 this country produced 2,981,152 long tons, imported 168,549 tons, and exported 5,580 tons, leaving for domestic consumption, largely for manufacturing chemicals, 3,144,121 tons.

In the Burgess plaster quarry in Cheverie, Nova Scotia, the presence of oil permeating the gypsum has been known for a number of years and has led many to think that a workable deposit of petroleum exists in connection with the underlying strata (shales), which are the equivalents of the oil-bearing Albert shales of New Brunswick.

Some very small coins are minted by foreign countries. In Russia 10 quarter *kopeks*, each containing 0.819 grams copper, equal an American cent. In Japan five 5-*rin* pieces containing 95 per cent copper, 4 per cent tin, and 1 per cent zinc, and weighing 3.564 grams each, are worth a fraction over 2c. United States. In China 18 *cash*, a coin made of copper, iron and tin, with a square hole in the middle, are equivalent to an American cent.

The finest opals formerly came from Hungary, Mexico, and Honduras, where they occur in igneous rocks. Australia is now the chief source of production, although the rich opal fields of White Cliffs, New South Wales, were only discovered by a mere accident in 1889. In 1902 the opals found in New South Wales were valued at $700,000 in all.

LABORATORIES FOR ADVANCED INSTRUCTION.*

By H. C. JENKINS.

The particular object of the laboratories under discussion is not to teach trades and raise up a generation of workmen, but to assist in the instruction of the future superintendents of operations; they should be designed not for the purpose of carrying on trade operations, but for study and research.

The differences between the training of a workman and the training of a manager are already so well defined that I would now submit that however desirable it is that a manager should possess personal skill in trade operations, his function is rather to know good and efficient work when he sees it, and to know the conditions and limitations under which it can be performed; his chief business is to utilize the operations of a great many different trades, rather than to possess manual proficiency in one. If this were more generally recognized a smaller value would be assigned to the "tail of a truck" as a seat of learning than is still unfortunately the case in many quarters.

The growing demands made at the present day upon the time usually available out of the life of the average candidate for the mining profession, renders it a matter of some importance to economize his efforts to the utmost. It must be confessed that by the time even the brightest of students, starting with a good general education, has acquired proficiency in pure and applied mathematics, chemistry, descriptive geometry, mechanical and free-hand drawing, geological science, physics, the elements of civil, mechanical and electrical engineering, and the practice of surveying and assaying, at least three years will have gone by. Consequently if the course is to last only three years there is no time remaining for the special work of mining engineering and of metallurgy, for which the foundation has been laid; this difficulty remains even after the subjects have been taught, not with the special requirements of academic examinations in mind, but upon the plan so ably shown by the late Professor Fleming Jenkin, and by Professor Ayrton, as regards electrical science, by Professor Judd as regards mining geology, and by Professor Perry in the teaching of the higher mathematics to engineering students, where as much as possible of the practically useful matter of the subject has been included with as much diminution of other labor as an intelligent sequence of study will permit. The economy of the student's time by the substitution of practical working courses underground or in works during the vacation, in the place of a term of apprenticeship, does appear to offer the possibility of counting upon his presence at the technical colleges in this country for another year, either by lengthening the recognized course to four years, or by giving the advanced instruction in the mining and metallurgical laboratories with necessary lectures, during a post-graduate course; although this latter alternative, it must be confessed, is manifestly the thinnest of expedients to hide an obvious fact.

This fourth year's work should be concerned with professional work as such. It should be preceded by a general acquaintance with science as well as with workmen, and with as much practical knowledge as may be obtained by the intelligent use of several long vacations spent as a workman underground or in some works.

It may be urged that all the work to be done in a fourth year's course in advanced practical laboratories might better be done by the student, as a junior assistant, on some works or in a mine. Much would, of course, depend upon the men under whom the laboratories are placed, whether they are of the academic type, that is, speculative physicists, chemists, and mathematicians only, or whether they are engineers, in the wide sense of the term, with teaching ability; and it must be remembered that, although for the purpose of acquiring the practice of a particular district, no better opportunity can be given than that found amongst the actual workers in mines and works, yet the instruction so obtained is limited to that particular practice; and there are many things that need to be studied in an experimental manner for which, as a rule, no, or very little, opportunity exists in a mine or in a works at all. To take the simple case of ore concentration, a worker in a particular mill, even if it happens to be well designed, which is not always the case, will see only certain types of machines, used in some particular way, and in five out of six cases the opportunities will be very rare for him to know anything of the behavior of these machines when used in another way, upon some other material, or for him to know what other machines would do in their place. Some of the deficiency can, of course, be made good by reading books or the catalogues of the makers of rival machines, but progress is not always either safe or rapid by such a plan, and a course of lectures, accompanied by a graduated experimental course of instructions on the principles underlying ore concentration as illustrated by the aid of well-selected laboratory plant will be of infinitely greater value in after life, whilst a short time in the first mill will correct any spirit of egotism, by which the student is occasionally led astray at the start, but from which his "practical" brother is also rarely free. The same considerations apply to furnace reactions or to wet treatment plant, and to many other things. The laboratory enables both good and bad practice to be contrasted, and gives the most valuable data and mental perceptions to the future designer of operations and plant, and in this connection it is difficult to say where practical experimental study ends and true research begins.

*Abstracted from paper presented before the Institution of Mining and Metallurgy, London, February 18, 1904.

JAMES GAYLEY.

THE PRESIDENT OF THE INSTITUTE.

We take pleasure in publishing a portrait of Mr. James Gayley, the newly elected president of the American Institute of Mining Engineers. To the 3,700 men who are members of that organization he can be known in person to only a few, but all of them will be glad to see the likeness of their titular chief.

The Iron & Steel Institute of Great Britain meets in New York during August, and it is most proper that the president of our Mining Institute should be a representative of that great basic industry. And an excellent representative Mr. Gayley is, for he is one of the band of those skilful men who were associated with Mr. Carnegie in his large enterprises, the companies which became the basis of the United States Steel Corporation. In recognition of his services Mr. Gayley was chosen the first vice-president of the United States Steel Corporation, with headquarters in New York City.

His early education was acquired at the West Nottingham Academy, Cecil county, Maryland, and subsequently at Lafayette College, whence he graduated in 1876, with the degree of mining engineer.

He began his career in 1877 as chemist for the Crane Iron Works at Catasauqua, Pa. After three years' service with the Crane Company, he worked in the laboratory of the Missouri Furnace Company, at St. Louis, and finally became superintendent. Returning eastward he was especially engaged to manage the blast furnaces of the E. & G. Brooke Iron Company, at Birdsboro, Pennsylvania.

Mr. Gayley's first real connection with the Carnegie interests was made in 1885, when he was given charge of the blast furnaces of the Edgar Thomson Steel Works. He soon began to institute economies in all the departments, introducing many furnace appliances, both money-saving and time-saving. This energy and ability were rewarded by his appointment to the general management of the works. From there he was promoted to the general office, then to managing director of the Carnegie Steel Company.

In 1898, Mr. Gayley was given by the Carnegie Steel Company the sole direction of the mining, shipping and storing of iron ore, and he now handles a greater quantity than any one person has ever done before. Notwithstanding a close application to the details of his business, he has invented many useful appliances in connection with American blast furnaces, bronze cooling plates, carbon bricks for furnace linings, and has recently brought to perfection and patented a process for producing a dry-air blast. He is also the inventor of an auxiliary casting stand for Bessemer steel plants, which holds the steel ladle while the heat is being poured and enables two converters to do the work formerly done by four.

Mr. Gayley has been a contributor to many technical societies; he has presented to Lafayette College a fully equipped chemical and metallurgical laboratory, in gratitude for the knowledge which enabled him to achieve a marvelous success in life when only a young man.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

PYRITE-FUEL SMELTING.

The Editor:

Sir.—Noting in your issue of March 3 that the discussion as to a term for designating the "oxidizing smelting of pyrite ores in a shaft furnace" is not closed, as I supposed to be the case on appearance of your editorial entitled 'Pyrite Smelting,' I would submit 'Pyrite-Fuel Smelting' or 'Sulphide-Fuel Smelting' for consideration.

The leading feature of the operation being thus emphasized; that is, the dependence (not necessarily complete elimination of carbonaceous fuel) on sulphur compounds as heat generators, the character of the furnace and its ore-charge are unmistakably inferable by those conversant with the subject. Either of the terms suggested seems, without being cumbersome, distinctive and comprehensive.

J. L. PARTZ.

Carters, Cal., March 14, 1904.

PYRITE SMELTING.

The Editor:

Sir.—I venture to contribute a few observations to the discussion on this subject, which was resumed by Mr. Godshall's letter in your issue of February 4, and followed on February 11 by the contributions of Mr. William A. Heywood and Mr. G. F. Beardsley, respectively.

Concerning the designation 'pyritic smelting,' it seems immaterial whether we continue using the term or not, but in my opinion it would serve no purpose to alter a technical term, which as such has found a place in many metallurgical text-books and has become established by common usage. Its definition, according to recent experiences, has been altered to the extent that in future we shall not regard the hot blast as one of the *essential* features in the direct smelting of heavy sulphide ores for matte. Mr. Godshall briefly defines 'pyritic smelting' as a form of matte smelting, whereby the *maximum* amount of heat is derived from the combustion of heavy raw sulphide ores in a blast furnace, in addition to the *minimum* amount of necessary heat obtained directly from carbonaceous fuel, and I believe this definition will be acceptable to most metallurgists.

Whether hot or cold blast should be used will probably remain a question to be determined by the special requirements of any particular proposition, though recent experiences strongly point to the fact that an increased air supply for the rapid oxidation of the sulphur and iron is all that is required to bring about the desired conditions.

With lower blast-pressures and lower charges it may be possible that the hot air-blast has an initiative action on the combustion of the sulphides, but, after all, it is not the temperature of the air, but its volume, which is responsible for the reaction in pyritic smelting, and for the remarkable increase in the tonnage treated. Any metallurgist, who has had practical experience with matte smelting in blast furnaces, will be able to recall many instances, when his furnaces would 'drive' to such an extent that often not sufficient pots were available to cope with the slag flow, and the air-supply to the furnaces had to be reduced in consequence. With larger furnaces, better blowers, and a better equipment for the handling of large quantities of material, our aim to-day is to obtain just those conditions which, not many years ago, were accidentally produced, and almost considered objectionable.

When we compare the results of the experimental furnace run No. 5 with those obtained in the run No. 4, Mr. Heywood's figures are remarkable for the enormous increase in the tonnage treated. A few explanatory remarks from him regarding the duration of these experimental runs would no doubt be welcome.

I hope also that Mr. Beardsley, as late metallurgist at Mt. Lyell, will favor us with a more conclusive statement regarding the work done at Mt. Lyell with hot and cold blast respectively. He already informs us that the recent practice at Mt. Lyell has been to discontinue the hot blast, from which it would appear that the management found it profitable to do so. But even if the blast could be heated by waste-gases, as suggested by Mr. Beardsley, and all other conditions remained the same, it would be of great interest to know his experience with regard to the practical gain of using heated air under these circumstances.

Mr. Godshall quotes Mr. J. W. Nesmith's comparative statement giving the results of a test run at Silverton, Colorado. The figures are not conclusive, in so far as no attempt was made to ascertain, whether an increased air-supply alone would have brought about an increase in the furnace capacity.

Owing to a long absence from the United States, I am not competent to discuss the question concerning the inducements which central localities like Denver, Pueblo and Salt Lake, may offer to a matte smelting establishment to compete with lead smelters in the market for dry ores. The question, in my opinion, is certainly not to be settled by the mere cost of smelting per ton of ore, as in addition, cost of refining and realization charges would have to be taken into consideration.

E. A. WEINBERG.

London, March 2, 1904.

MINING IN RHODESIA.

The Editor:

Sir.—In your issue of March 10 there appears a letter purporting to be a "friendly criticism" by Mr. Wallace Broad upon an article contributed by me entitled 'Gold Mining in Rhodesia.' It is unfortunate that the general tone of Mr. Broad's contribution is not one which conduces toward friendly discussion.

In the main, the criticisms are so vaguely put, as scarcely to warrant comment. There are, however, some views rather forcibly expressed by Mr. Broad, which appear to me to be narrow enough to invite brief reply.

Mr. Broad seems to be confused with regard to the application of many of the remarks contained in my article, in that he associates them wholly with a property upon which he did some prospecting work. As a matter of fact, I utilized the impressions and figures obtained from four different mining companies with which I have been professionally connected for some years. Taking his paragraphs seriatim:

1. The Penhalongha mine, situated in Mashonaland, is the only mine in southern Rhodesia, which it has been found "advantageous" to open with adits or crosscuts. Unfortunately, to date, this class of work has not been wholly confined to this property. There are many mines in Rhodesia, the early development of which was attempted through adits; indeed, at both the Bonsor and Tebekwe mines, a good deal of this class of work was started, but it was found later that vertical or inclined shafts would be necessary (by reason of the limited amount of ore obtainable above the lowest adit level); so that under adverse conditions and at great expense, in which temporary and partial suspension of milling played an important part, these properties were permanently opened through shafts.

There are many Rhodesian prospects which contain adits, but I know of no instance where this work has been of more than temporary importance. Indeed I know of one property in particular where no less than 2,700 ft. of work was carried out on ore which outcropped less than 60 ft. above the level of the adit.

2. The elevation of the plateau upon which Bulawayo is situated, is as stated, namely, about 4,450 ft. above sea-level, but the individual hills and kopjes rarely reach an elevation of more than 300 ft. above the undulating plains in their immediate proximity.

One of the sights of southern Rhodesia, which has evidently escaped Mr. Broad, is the World's View, a spot in the center of one of the large "granite belts," and named by that empire builder, Cecil John Rhodes. In the very midst of this extensive area, which has been described as "an undulating plain, embracing a perfect sea of conical shaped kopjes" lies all that remains of this great man. Similar natural monuments in a modified form are found in all the granitic belts of Rhodesia. In these belts numerous quartz deposits occur, chiefly segregations, but, with the possible exception of one or two lodes, no economic value can be attached to these occurrences.

7. As compared to the numerous alluvial districts in which the writer has mined on the Pacific slope of the United States, the deposits of southern Rhodesia are extremely limited, not alone in vertical depth, but in superficial area. Having examined a large number of these occurrences in Rhodesia I have rarely found a depth, including "top dirt," to exceed 20 ft. Although some of the deposits contain fair gold-values, very little attention has been given to this branch of mining; for the reasons already stated.

One would hardly expect the same degree of erosion to obtain in a tropical climate, as in a climate where extreme cold obtains.

9. I was not aware that any definite statement had been made, by any of the archeologists who have investigated the ancient ruins of Rhodesia, touching the peoples who actually were responsible for the numerous old workings existing in the country. From the works I have read, I gathered that considerable doubt existed upon this subject. Mr. R. N. Hall, who has made an exhaustive study of the subject and who has carried out some very important work lately, at the Zimbabwe ruins, in discussing the material which is to be embodied in his new work shortly to be published, informed me, only last November, that he had been able quite re-

cently to upset many of the older theories, and, in fact, is making many alterations in his own original work.

11. If in assuming a payable limit to the grade of any given ore, and graphically segregating the payable from the non-payable ore, as well as applying the same idea to the other factor 'width of vein,' one is not comprehensively defining the lateral extent of individual shoots which it is intended to stope, perhaps Mr. Broad will favor us with the more important considerations. As a matter of fact to the professional man, the graphic expression of values and widths has not much significance. It has its importance, however, in that it provides a ready means of enlightening those who are unable to comprehend the points at issue by reason of the maze of figures and methods necessarily employed in such work.

12. Mr. Broad has gone entirely astray on the subject of development work. In the first place it is not customary to charge the cost of shafts to 'development work.' This disbursement is charged direct to 'capital' account. All shafts are treated as assets, and the moneys expended thereon are redeemed through depreciation account, as it is presumed that the shafts will be of use just as long as any of the surface equipment.

It is necessary to establish a basis in dealing with the development redemption account, that is, in redeeming the moneys expended in developing the ore which it is expected to mill, and as all other distributions are made on the basis of the tonnage milled, it is usual to treat development account in the same manner; the cross-section of the driving or winzing has absolutely nothing to do with the matter, nor is the small amount of clean payable ore, taken from this work, of significance; much less the total cubical contents in waste rock and ore, which Mr. Broad has, *without having had any vein widths,* taken so much trouble to compute at 4,500 tons. As a matter of fact in the case cited it was found advantageous to extend the development work into the foot-wall of the vein. The calculation was quite correctly given by me, and was arrived at by dividing the total cost of development for a certain period by the number of tons milled during the same period. The cost per foot, for the work, was, as explained, above the average, because a comparatively small footage was obtained during that particular period; but, as stated, individual months could have been chosen which would have shown a great improvement. The object, however, was to show the distribution of the moneys expended upon the work rather than to present a lot of flattering figures. Development work, that is, drifts, when extended with machine drills, in hard rock and on a comprehensive scale, seldom costs less than $20 per foot in Rhodesia. This of course includes all expenses not only at the mine, but in London and at the local offices and engineers' charges. It is quite clear that an excessively small footage, where a full staff is being employed and other constants are evident, reflects unfavorably in the cost per foot. Perhaps Mr. Broad had in mind the bare contract price, which in Rhodesia ranges from $6 per foot in oxidized ground to $15 per foot in hard rock. The facilities offered in individual cases is also an important factor.

13. The idea expressed by Mr. Broad that it would be advisable to exclude the air-compressor from the equipment of a mine, and in consequence (by reason of the irregular supply of native labor) operate the mill irregularly, as has been the experience of more than one mine, cannot be taken seriously. There is not one mine in the whole of Rhodesia which has been able to run continuously on ore furnished by hand labor. It is not usual to charge any part of the machinery and plant to development account.

14. In referring to the weight of stamps I had no particular plant in view. I have myself erected three mills in Rhodesia, using different weights, namely, 1,050 lb., 1,150 lb., 1,258 lb., while as far back as 1898 I erected a mill in the Transvaal of 1,385 lb. stamps. I subjoin the weights of the individual parts of the heaviest stamps yet made: Stem, 604 lb.; head, 437 lb.; shoe, 289 lb.; tappet, 135 lb.; total, 1,465 lb. The die weighed 165 pounds.

The evolution of the mining industry, while probably not so marked in Rhodesia during the past three or four years as in other countries, has brought about great changes in ideas, impressions and methods.

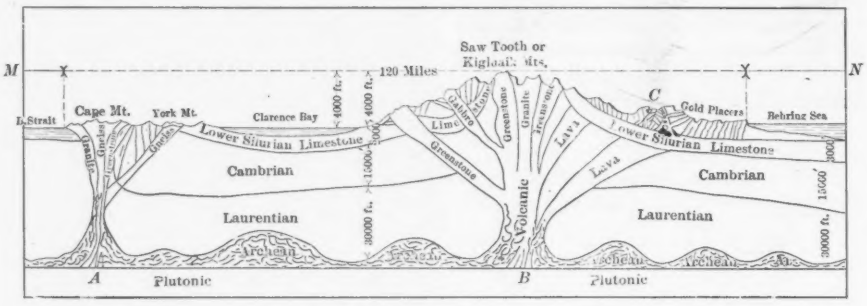


FIG. 1.—GEOLOGICAL SECTION ACROSS SEWARD PENINSULA, BERING STRAIT TO CAPE NOME.

I hope that Mr. Broad, who, as indicated by his remarks, is a geologist of high standing, will favor the readers of the JOURNAL with his impressions of the geology of those parts of Rhodesia in which he has spent so many years, and I am sure that such an article from him would prove of great interest to professional men.

Personally, I can only concede a difference of opinion upon those subjects which in my original paper were too generally stated or in Mr. Broad's criticism too vaguely to afford ground for either criticism or reply.

F. C. ROBERTS.

New York, March 16, 1904.

THE DEPOSITION OF ORES FROM AN IGNEOUS MAGMA.

The Editor:

Sir.—Referring to my previous letter on this subject, where special emphasis was put on the importance of being able to distinguish a secondary from a primary magma; and likewise the advisability of taking a special case to illustrate the subject:

The case I have submitted is in the Seward peninsula of Alaska; the sketch shown in Fig. 1 gives approximately the geological conditions which exist in that district.[1]

The most prominent feature in this section is the great central eruption called the Kigluaik mountains, the highest peak being about 4,000 ft. above sea level. The core of these mountains is composed of the eruptives, granite, greenstone and gneiss; and they are nearly all of a schistose character. According to Brooks, the gneissoid facies are original structure, not having been altered by metamorphism or pressure. That fact is of great importance in determining whether these eruptives are secondary or primary magmas.

Granites and greenstones are generally supposed to be of Plutonic and gneiss of Archean origin, but here it would appear as if they were Silurian or Cambrian. The Plutonic menstruum beneath could not possibly penetrate through the Archean, Laurentian, Cambrian and Silurian formations, without fusing into a magma these superincumbent strata; unless the eruption was of a volcanic character, which is not the case in this instance.

The section in Fig. 1 is based on the fact that the limestone found at Cape York and Port Clarence is Lower Silurian, as established by Brooks and Collier on the authority of Professor Schuchert of the National Museum. From the outcrop of the limestone at Port Clarence it appears to be at least 3,000 ft. thick, of a gray, sedimentary character, but where it is tilted up and metamorphosed by the eruptives on the sides of the Kigluaik mountains it is crystalline.

Now, supposing that basal limestone before the eruption to have dipped from Port Clarence to Cape Nome, a distance of 80 miles, at an angle of 5° from horizontal; there would be over 30,000 ft. thick of Upper Silurian, Devonian and Carboniferous strata at C, in Fig. 1; all covered to a depth of 1,000 ft. or more by the water of Bering Sea. And all resting conformably on the 3,000 to 5,000 ft. of Lower Silurian limestone.

Such a covering of arenaceous, argillaceous, calcareous and carboniferous sediments, would greatly retard the dissipation of heat from the Plutonic nucleus; and at the same time by its weight prevent a volcanic eruption. In consequence of which the Plutonic action would gradually work its way up by fusing the Archean, Laurentian and Cambrian rocks, until it reached the Lower Silurian limestone. And then, when that limestone was heated to 200° C., an uplift was possible. A gentle uplift at first would fracture the superincumbent strata in several thousand places, and down these cracks the sea-water would rush until it reached the glowing limestone, when there would be an eruption similar to what would be required to produce the Kigluaik mountains. Such an eruption would relieve the pressure, and a general uplift would slowly arise all over the district at C; which is the Cape Nome mining district.

The billions of tons of sea-water which would pour down on the 1,200 sq. miles of glowing limestone underlying the district, would convert that limestone into a boiling mush, with a temperature over 500° C. and a pressure over 15 tons to the sq. in.;

[1]The photographs on pp. 473 and 474 we owe to the courtesy of the U. S. Geological Survey.—EDITOR.

forming an aqueous igneous magma, which mixing with, while fusing, the superincumbent strata, would produce the kind of bedrock we find all over that district (mica schists, chloritic slates, soft yellow porphyry, etc.); and through vents innumerable would issue streaming vapors, forming geysers, the calcareous constituents of which would alter the carboniferous shales at the vents by induration and replacement into crystalline limestones and

FIG. 2.—SILURIAN LIMESTONE.

marbles, such as are found there at present; in some places wholly changed, at other places partially calcified, showing that the cause was hot solutions or vapors of lime.

But the sea-water would do more than that; as at that period it probably contained a much higher percentage of muriatic, sulphuric, fluoric, and other acids, than it does now. It would, therefore, dissolve a much larger quantity of gold, silver, tin, silica, soda, magnesia, etc. Suppose that it contained 1 oz. of gold per 100 tons of water, and a corresponding higher ratio of the other ingredients. And suppose there were a thousand billions of tons of water absorbed and evaporated. We should then have ten billion ounces of gold distributed through that secondary magma, which by aqueous igneous corrosion had metamorphosed the whole district.

Now the schists, slates, porphyries, etc., forming the bedrock of that district, contain about 25c. per ton in gold. And where the quartz seams, and graphitic matter are most abundant, there are found pockets of greater value. And tin accompanies the gold in the bed-rock all over that district; and at certain places, such as the York mountains, it is found as cassiterite nodules in feldspathic lodes.

In a previous letter I said this geological condition was typical of the gold-bearing strata along the whole Pacific coast. But in California where the bed-rock is to all appearances the same as that above described, the geologists, such as Whitney, King, Le Conte and others, did not find the Lower Silurian limestone exposed, nor the characteristic fossils of that formation, the *maclaurina manitobensis,* and *columnaria,* which Brooks and Collier found at or near Fort Clarence. Consequently, because there was a dearth of fossils of every kind, the California formation was called Tertiary.

Now if the California formation is Tertiary, then the mushy secondary magma which produced gold veins, and the geyser-belts around Columbia, and Mokelumne hill, must have originated from a Cretaceous instead of a Silurian limestone. And as the Cretaceous overlies the Carboniferous by many thousands of feet, when they are in regular sequence, we might expect to find coal and oil under the granite at West Point.

But the want of conformity might alter the regular sequence, and place the Silurian where the Cretaceous is supposed to be, and so bring California under the same geological conditions as those in the Seward peninsula; and we know that in Southern California the tin is found under conditions similar to those at Cape York. Whether it is the *maclaurina* or the geologist that is at fault is not the question at present.

The point which I wish to establish is, that a limestone 3,000 to 5,000 ft. thick, covered with 30,000 ft. of soft sedimentary strata, containing nearly all the minerals in some form, would, when heated to a certain temperature, and douched with sea-water containing the chlorides, sulphides, fluorides, etc., of magnesium, sodium, potassium, silicon, gold, silver, tin, etc., produce a magma in every way similar to what we find at Cape Nome and Columbia, and all along the Pacific coast. And it would not matter whether that limestone was Silurian, Carboniferous or Cretaceous; the magma would originate from the limestone, and the precious metals found in or differentiated from that magma, would have their origin from the sea-water that caused the eruption. And if that origin was in the Cretaceous formation, there might be sedimentary strata and the coal-measures underneath the granites, greenstones, gneisses, lavas, etc., which as magmas were generated and erupted from that aqueous igneous origin. Accompanying this are photographs of lime-rock, and mica schist, given by Brooks and Collier in their excellent reconnaissance of that region.

Fig. 2 is the solid gray Silurian limestone found undisturbed in place at Port Clarence and elsewhere, and which appears to be the basal origin of the vast metamorphism found in the district under consideration.

Fig. 3 is a much contorted, calcified mica schist, which the geologists call a lime-stone. But it is really not a limestone in place at all. At one time probably it has been a Carboniferous shale, and then by metamorphism transformed by induration and replacement into a graphitic mica schist, and by further replacement by geyser action, into a foliated crystalline limestone or marble. Its position is probably more than 10,000 ft. above its basal origin.

Fig. 4 is a mica schist which has been converted from a carbonaceous shale by a hot

FIG. 3.—CONTORTED SCHIST.

solution of minerals under great pressure and motion; and is given to show one of the stages of metamorphism. Wherever that mica schist exists in lateral contact with a geyser vent, there we find the schist more or less calcified: and under such conditions the geologists have rightly called it a schistose lime-rock. These schistose lime-rocks are found in the now extinct geyser-belts at Columbia, Volcano, and other places in California, where the gold solu-

tion can be proved to have come up; as well as at Nome in the Seward peninsula.

I also observed what appears to have been a true coal seam about 6 ft. thick, transformed into chert and quartzite by the hot silica vapor or solution from a quartz ledge trying to break through from beneath; but the coal seam being tough, yielded to the pressure and was given an anticlinal fold. An assay of the quartzite at the apex gave $13 per ton in gold, whereas a short distance on each side of the apex there was nothing but a trace of gold.

Now that I have defined my position with respect to a secondary magma and its aqueous igneous origin, I would like to know from the mineralogists how to distinguish a magma such as granite, greenstone, gneiss, gabbros, serpentine, etc., produced in that way; from the same eruptives produced by Plutonic action, as a primary igneous magma? Do the mineral crystals or phenocrysts produced by crystallization from a molten mass, where the fusing temperature must have been at least 1,000° C., differ in any way from the same mineral crystals fused by solution and pressure at 100° C., and then crystallized by reduction of pressure alone?

If it were possible to tell whether a magma came from the Plutonic nucleus of the earth, carrying the metals from that incandescent bath; or whether it only originated from some potential source of heat and pressure, such as stratified limestone a few thousand feet beneath the surface, it would greatly assist the engineer in his effort to arrive at the true dynamic cause, and possible permanency of metalliferous veins.

ROBERT STEVENSON.

New York, Feb. 26, 1904.

FIG. 4.—MICA SCHIST.

What are the conditions of a science? and when may any subject be said to enter the scientific stage? When the facts of it begin to resolve themselves into groups; when phenomena are no longer isolated experiences, but appear in connection and order; when, after certain antecedents, certain consequences are uniformly seen to follow; when facts enough have been collected to furnish a basis for conjectural explanation, and when conjectures have so far ceased to be utterly vague, that it is possible in some degree to foresee the future by the help of them. Till a subject has advanced as far as this, to speak of a science of it is an abuse of language.

MECHANICAL INGENUITY IN MINING.*

In the course of a presidential address to the Association of Mine Managers of the Transvaal, Mr. R. M. Catlin said:

"Invention may possibly be a momentary inspiration, suggesting a useful and desirable result to be attained; but, as a rule, if one were able to trace out all the facts, it would be found that there are certain predisposing causes or circumstances that clearly lead up to it, and therefore it often happens that several men, widely separated, invent the same thing at practically the same time because the time is ripe for it. But in the rush of prosperity there is little time for observation and study, and it is when striving against adverse conditions that, despairing of obtaining results by old methods, new paths are sought to the same end. While no doubt there may be many improvements in the method of handling and treating, it is also quite likely that more attention will be given to the breaking of the ore than formerly, particularly in those mines where the values jump about considerably from one seam to another. A stope seldom yields ore of more than 80 per cent of its sampled value. Here would seem to be a promising field for improvement, and it seems probable that improved methods for more frequent sampling of the stopes will be sought for and closer supervision exercised over the stopes to reduce the quantity of unpayable rock broken. The causes of this difference between sampled values and actual results are due no doubt in one way and another to our eagerness to reduce total costs by increasing the tonnage. The miner is often paid in proportion to the quantity of rock he breaks, and naturally he prefers the strongest explosive possible, and the grade of ore is apt to suffer accordingly. We use more nitro-glycerine per ton of ore broken than is common elsewhere, and it is therefore not remarkable that we produce a greater percentage of unsortable fines.

Since the war, lack of labor has accentuated these conditions, and the greed for tonnage is greater than ever. Costs per ton are useful for comparison only when very fully detailed and based on similar conditions. Probably few, if any, realized when, returning after the war, we found most of the machinery and plant of the mines intact, even a portion of the great difficulties to be surmounted. Possibly had we had to govern us an absolute monarch or dictator whose will was law, wise and well-advised, earnestly desiring the rapid re-building of the industry, the path might have been shortened and the way made smoother to self-government. But temporary dictators with preternatural wisdom are not much in evidence these days (or in history, for that matter). The average white man must have the idea that he is a free man; besides that, he is apt to entertain notions on political economy, and it seems likely that the chief art of modern government is to be able to humor popular notions as far as possible without involving chaos. In this case not only our views, but those of others far away and out of touch with our conditons are to be taken into account. And again, here is a country of much promise in process of political formation, and it is to be expected that here should flock from everywhere men with all sorts of new schemes in political economy, for where are they to find more propitious conditions for the application of their ideas than in a new forming State free from many of the traditions and other complications incident to older countries. And so it is that almost every condition about us has made for delay rather than progress, and hence it seems not only natural that our progress has been slow, but it should be a matter of congratulation that we have done as well as we have.

Mechanical ingenuity has done, and is doing, much to cheapen the cost of production, but there is a limit beyond which these improvements cannot go—there must always be use for the "hewers of wood and drawers of water." The presence here of a quantity of cheap labor has probably had quite as much to do with the building up of the industry as the presence of the gold in the reef. In fact, it is probably the more important factor of the two, for the gold contents is an immutable fixed fact which no social or political upheavals or other act of man can alter, while the cost of production is helplessly dependent upon the other factor, which may be made the shuttlecock of party politics. But the fact remains that if this gold-field is to be fully worked, there must be a sufficient supply of unskilled labor, and as it is clearly the one condition on which all other South African problems depend, it seems fair to assume that sooner or later the solution of that problem will be found.

*Abstracted from *South African Mines* of February 13, 1904.

HEATING ZINC SHEETS FOR PRESS-WORK.—The *Metal Industry* says: "Zinc is a peculiar metal. When cold it is hard and crystalline, but if slightly heated it is very soft, and is susceptible to any treatment that brass may receive. In drawing zinc sheet in a press, the difference between the melting point of the metal and that of the temperature at which the best drawing takes place is so small that the problem of heating becomes serious if one is not conversant with the fact that zinc may be heated in oil. Attempts are made to heat by other means, but much waste occurs. To heat in this manner a heavy oil with a high flash-point should be used, and a thermometer employed to register the temperature. This instrument will obviate any over or under-heating and prevent waste from such means. In addition to acting as a heating agent, the oil has a good effect on the drawing dies."

The ordinary alteration of rocks due to moisture is called hydro-metamorphism.

THE ECONOMIC RATIO OF TREATMENT CAPACITY TO ORE RESERVES.

By H. C. HOOVER.

Although every metal mine is a problem peculiar to itself to such an extent as to upset most generalizations, it will be not wholly useless to contemplate certain problems in the abstract. In various forms they confront every engineer, sooner or later, and although discussion involves much reiteration of elementary principles, yet there are so many mines in which even elementary matters of good management are continually disregarded as to warrant such repetition. The ensuing discussion applies mostly to that great majority of mines, the uncertainty of whose continuity in depth necessitates in every project of general policy a substantial margin of security against the unknown. Starting with an assumption of unbroken continuity to their utmost boundaries, our South African friends need but little outside of compound interest tables upon which to found their finance. In the great majority of mines, however, the result of development at their lowest levels remains speculative and gives a zest such as an assumed persistence can never afford.

That the most economical and profitable treatment-capacity is the maximum capacity which can be employed, is not difficult to demonstrate; that the maximum must depend, however, upon the speed of development, and that development must be pushed as fast as the limitations of nature will permit, is but to state a corollary. Yet, curious as it seems, the number of mines, which have been operated upon the principle that the mill is the fixed quantity and the mine the variable, exceeds the number conducted upon the reverse plan. The objective of development in this preponderating number is to feed the mill. This assertion is verified by the fact that while the majority of mines now in operation are more than ten years old, nevertheless a minor number have reached a depth of over 2,000 ft. when they might, even in this comparatively short period have attained a depth of 3,000 ft. had they pursued the policy of development under highest pressure and the erection of treatment-units such as would keep the ore-extraction close upon the heels of such development.

It will be granted that the true objective of mining is to gain the greatest profit from a given body of ore. The maximum output is not only necessary for the cheapest production, but money locked up in ore underground is idle money, and the profits from mining can be increased in no mean degree by rendering it liquid. There are, however, limitations imposed upon the investment of large sums of money in equipment to secure the maximum output, in view of the uncertainty of continuity in depth, which need to be considered. In considering these limitations, and a method by which the economic ratio may be arrived at, it will be necessary to demonstrate the generally accepted proposal already laid down. The problem may be reduced to the question of conducting operations upon a given output as against a greater output, because few well managed mines of the character under discussion are, in their initial stages, equipped to their maximum possibilities—and certainly the great majority, as shown above, are not yet so equipped; therefore, the problem in actual practice presents itself either in the form of increasing the output, or determining originally some volume of output to be provided for, as against some smaller volume. We may call the initial treatment-capacity the primary equipment, and the increased plant the secondary equipment. The factors which enter into the problem are as follows:

(1) The cost of production as affected by increased output.

(2) The redemption of capital invested in secondary equipment.

(3) Limitations imposed by the uncertainty of continuity in depth.

(1) The elaboration of accounts during the past has introduced to the engineer many complications of mining finance which did not trouble our forefathers. We now divide the various charges against working expenses into, first, those charges variable with tonnage, such as development, haulage, treatment, etc., and, second, those charges, usually referred to as "fixed," which depend partially upon the element of time as well as tonnage, and include, partially or wholly, pumping, management, amortization[1] of capital invested, etc. Moreover, there is a factor of no mean importance arising from the loss of interest through idle profits locked up in ore standing in the mine; this also must be taken into account.

From the standpoint of such "fixed charges" as depend partially upon the element of time, obviously the shorter the period involved in the extraction of the ore the better. The introduction of increased equipment necessarily shortens the time of extraction and the saving (and therefore increased profits), which can be thus effected, amounts nearly to the whole of the fixed charges over the increased tonnage. There are certain inevitable co-ordinate reductions in working expenses, other than fixed charges, as the result of a larger volume of output. What these amounts will aggregate, in increased profits on the increased tonnage, depends somewhat on the proportion of the increased volume to the volume previously treated, but the total saving on the increased tonnage may be taken in minimum as equal to the fixed charges. Also the profits will be increased by the interest earnings of the extra profit taken out as between the earlier time it would have been put into service by the secondary equipment, and the later time it would be released by the primary equipment. If this be taken at a fixed rate, say four per cent compound interest, it then becomes a factor of the profit per ton of ore. A minor addition also arises from the increased interest-earning on the greater profit secured by the increase of profit arising from the saving of an amount equal to fixed charges. We may consolidate all these additions to profit, as the result of expanded output (of course not including the ordinary profit on the ore), into the one phrase "increment of profits."

How important this "increment of profits" may become will be seen by taking a few examples. On a low-grade deposit, yielding a profit of $2 per ton, under California conditions of fixed charges of, say, 30c. per ton, on an increased tonnage of 15,000 tons per annum, the increment at the end of three years would amount to over $20,000. With a mine yielding a profit of $10 per ton under Western Australian conditions of a fixed charge of, say, 75c. per ton, the increment in three years, on the same increased tonnage, would aggregate over $65,000. The rapidity with which this increment of profits accumulates is a more detailed demonstration of the advantage of the maximum output, and it is also a demonstration of the necessity for a maximum speed of development.

The volume of these savings is so large as to render the question of justification of increased capital expenditure for their realization a matter of easy approach.

(2) Reduction works, and subsidiary plants thereto, represent large sums of capital and such plants are either worn out or become valueless through exhaustion of the mine. The hypothesis that the clothing of dead mines is valuable was long since exploded, although the public sometimes seems not to have heard of the explosion. In any event, the capital must be recovered from the mine, with compound interest, during the life of the mine. The cost of installation varies with the locality, character of ore, etc., but we may take the example of a Californian gold mine on the one hand, where equipment to handle an output of 15,000 tons per annum would cost, say, $18.000 and, on the other hand, a West Australian gold mine, where the same volume of ore handled would involve an expenditure of $50,000, with more complex treatment and other causes involved. The Californian plant, with four per cent compound interest, at the end of three years, would stand in at about $20,000 and the West Australian plant at about $57,000.

In these cases, less than three years' accumulation of the increment of profits is required to amortize the entire capital involved. Given an instance of a low-grade ore and a high construction cost, the necessary time would be longer, but in a particular case which has come under my observation, of very high profits per ton of ore and moderate installation costs, the increment of profits over 18 months was sufficient to amortize the expenditure.

(3) At the time of proposed equipment the life of a mine of this class is an unknown factor. Despite this, however, as shown above, the increment of profit so overtakes amortization as to make it necessary to have but short life in sight to justify the capital expenditure.

A certain part of the life of the mine is tangibly visible in its ore-reserves. Unless a blunder was made in initial installation (or in the remote case of a mine fully developed before equipment), then with vigorous development and continuity in depth the ore-reserves of a mine will gain on the treatment capacity. This gain will eventually reach a point where the visible life becomes equal to the period at which increment of profits overtakes amortization. So long as the reserves continue to gain upon the treatment-plant, additional units should be erected until the most vigorous development is no longer able to more than keep pace with the output. Nor will such a policy entail an unusual accumulation of ore-reserves; in most cases it will be not more than a three years' supply. Thus it becomes possible to determine absolutely the volume of treatment-capacity without any speculation as to continuity in depth. That it is an obligation of good management to set up additional treatment-units whenever increment of profit due to them will overtake amortization, is obvious.

It seems clear, then, that the maximum profit from any mine can only be obtained by the most rapid exhaustion of the mine, and that most

[1]By 'amortization' is meant the recovery of capital invested with accumulated interest thereon.

rapid exhaustion is to be secured only by the most rigorous prosecution of development and the maximum equipment which can be employed. Yet in the majority of mines the caution of sound business management, owing to the unknown factor of continuity in depth, imposes limitations upon the extent to which capital should be invested in equipment, and a general rule for the determination of the size of equipment might be framed as outlined herewith:

If by vigorous development the visible life of the mine, as shown by the ore-reserves, is lengthened so as to exceed the time required for a unit of treatment-capacity to earn an amount, through the increment of profits, equal to amortization of the capital invested in that unit, then the installation of another unit becomes not only justifiable, but an obligation of good management.

The Economic Limit to Accumulation of Ore-Reserves.—This subject may appear as merely a phase of the preceding, and a natural corollary to it. We have a limit beyond which the increase in ore-reserves justifies an increase in plant-units; in other words, there *is* a maximum reserve which it is advantageous to have in a mine.

It has been suggested that, given a deposit of fairly regular continuity in depth, an accumulation of ore-reserves to this excessive extent means a certain amount of locked-up idle profits, and that this profit might be secured without over-equipment if the management took the risk of increasing the output before they were wholly justified by the increase in reserves, the result being that the same maximum output could be maintained without the loss. Aside from the risk, there is one matter of general policy in the conduct of a mine which affects the case; it may be expressed thus:

Every deposit of the character under discussion is sure to get poorer eventually and fail at some point in depth. On a paying mine failure at any given level does not mean the abandonment of the mine at that point. To what depth the search for ore should be pursued through blank country is a matter of local judgment based on the character of the deposit and the conditions which determine its discontinuance. That this work should be pursued while the reduction works are in operation is a *sine qua non* of good management. Not only does it cost less while other operations are in progress, but the mine is providing the expenditure required to do it, which the owners are not likely to do afterwards. Mines are difficult to kill in proportion to their greatness; the more profitable their past career the deeper will their unprofitable exploration be carried. A mine with an ore-reserve equal to the period set out above possesses the sinews for pursuit in depth for an equal period; and that period will probably prove sufficient to exhaust reasonable hopes and to prevent the premature abandonment of possibly valuable property. As a matter of policy, then, I believe that the maximum provided as above should form also the minimum.

The economic and advisable ore-reserve, therefore, will be equal in volume to the annual output multiplied by a number of years just under that needed by the increment of profits to equalize the amortization required to construct increased treatment-units.

Huxley said that Spencer's idea of a tragedy was the killing of a deduction by a fact.

GOLD DREDGING UNDER DIFFICULT CONDITIONS.

By F. WINTER TAYLOR.

It is not within the scope of this paper to discuss the various conditions which combine to make the installation of a gold dredge advisable. For present purposes, I presuppose that adequate prospecting and inquiry into all the circumstances have been made before the decision to construct has been reached.

Obviously it is impossible to make a standard design which will be applicable to every class and calibre of dredge. Dredges are built for different purposes; for prospecting, in which case some miles of a river may be traversed in the course of a year, and, owing to the nature of its work, the dredge may be lightly constructed; for systematic and thorough working, in places where the value and formation of the gold-bearing gravel are already ascertained, and where the dredge can therefore be constructed in accordance with any special features which may be presented. A dredge of the latter class may not work its way ahead more than a quarter of a mile in a year. From so many variations in design occasioned by such variety in working conditions, I prefer to choose as my subject the design of a dredge that would have to work under exceptionally hard conditions; that is, upon a non-navigable river, where there is a deep layer of gravel above the bed-rock, and where the intention is to dredge all the gravel right down to the bed-rock itself.

The necessity for thorough rigidity and strength in every structural detail cannot be too strongly emphasized. This necessity arises from the fact that the load comes upon the main engine with extreme irregularity, and the sudden demand for full load causes a sharp shock throughout the dredge. The maximum amount of energy is required when a bucket is digging its cargo of gravel from the face; immediately it is filled, there is a rebound, the whole dredge receding until the strain upon the head-line overcomes the receding tendency and a forward movement follows. During the recession, the only energy required from the engine is for the execution of its ordinary work of hauling the main buckets up the ladder, operating the pump, etc. Thus in the course of a few seconds the load changes from heavy to light.

In choosing the main engine, therefore, all designers of dredges, after calculating the energy required for normal work, should add a substantial margin. It is not an undue extravagance to allow 50 per cent.

This procedure should also be followed in calculating the required thickness of mooring-lines, especially of the head-line, which besides having to bear the sudden strain of the backward motion of the dredge, has in special emergencies, such as occur during heavy floods, to sustain the additional strain caused by the strong current. Many dredges have two head-lines of equal strength, each capable of withstanding any strain that can be foreseen.

Pontoon.—It is not, I think, necessary to give details of the design of the pontoon itself, whether it be made of iron, steel, or wood. Any design which ensures strength, and includes efficient cross-bracing, will meet the purpose. There is one point, however, in connection with the pontoon which must be mentioned. If it is built of wood, it is advisable that steel or iron plates should be fixed so as to completely cover the bows, as a safeguard in flood-time, when the heavy logs which come down-stream offer a menace to any wooden structure, or of course, to a metal one, if too light. As a result of the neglect of this very necessary precaution, I once witnessed the total loss of a dredge.

Disposition of Machinery.—It is obvious that some care must be taken to calculate the weight of the different parts of machinery, and to place them so that the dredge may have no list to either side. This is only necessary, however, within somewhat wide limits, for it will be seen that the lower end of the ladder during the greater part of the time work is going on, is well below the pontoon, and therefore acts more or less as a balance weight and serves to keep the dredge on even bottom. In some of the older dredges I have known, the boiler was on one side, while the winches and lighting engines, together with all the heavy gearing necessary for obtaining slow speed on the top tumbler, were on the other. This resulted in a list to one side; this is avoided in more modern practice; as shown in my plan.

This embodies the main features which are common to all dredges of its class. I have, however, added and altered several details suggested by accidents and the like which I have witnessed.

Winches.—These are driven by an engine, of vertical type, fitted with reversing gear. There are six winch-drums, on three shafts. The head-line and ladder-line drums are on one shaft; the two bow lines on another; and the two quarter lines on the third. Each shaft has at its back end a cog-wheel worked by a worm. The three worms are on a shaft coupled to the main shaft of the winch engine. Each pair of drums is fitted with a level which puts its particular worm into or out of gear. Between the two drums on each shaft is a clutch which, while putting one of the drums into gear, puts the other out. It is, therefore, necessary to arrange a brake on each drum, to control it when out of gear.

The working of the winches during actual operation is therefore as follows: Assuming that the head and ladder lines are satisfactorily adjusted, the bow and quarter lines which haul the dredge to that side of the cut toward which it is wished to progress must be put into gear; this automatically puts the bow and quarter lines on the other side out of gear. As the lines are taken up on the one side, therefore, those on the other are slackened, the tension being adjusted by means of the brakes on the drums. It is found advisable never to slack off these lines altogether, as a light tension is required to prevent swaying of the dredge, an effect which would damage the buckets working at the face.

Length of Lines.—With regard to the ladder line, this is a matter of straightforward calculation, depending only upon the estimated average distance of bed-rock from the surface of the water. The designer will, of course, note that the length of the head, bow, and quarter lines must be arranged according to the maximum width of cut. The head line is the radius of the circle of which the dredge's sidewise cut is an arc, and the shorter the head line, therefore, the smaller that circle. It is obviously a disadvantage for a dredge to travel on the arc of a small circle, inasmuch as the deviation of the side line from an angle of 90° with relation to the sides of the dredge becomes exaggerated (the angles formed becoming too obtuse on the one side and too acute on the other), and the result is that winching

presents unnecessary difficulties. It is, therefore, advisable to make the head line of considerable length, and experience proves that it should not be less than five times the maximum width of the cut.

Backers.—Owing to the fact that these have to be moved from time to time as the dredge progresses, it is advisable, in order to economize labor, to make them as light as possible, consistently with sufficient strength. If no standing timber is conveniently at hand, a piece of 6 by 6 in. timber, sunk in the earth four feet, will be found sufficient to withstand the pull of the side lines. Since, however, the dredge takes some time to work ahead any appreciable distance, it is worth while to make the head line backer quasi-permanent. It should consist of a heavy log sunk in the earth some eight or ten feet. Strength is additionally necessary in this case, owing to the fact that on abnormal occasions, such as arise during the prevalence of floods, the head line has to withstand the whole of the dragging tendency of the dredge.

holding the weight of the ladder, by means of the triple-purchased block through which the ladder line is reeved, and of strengthening the pontoon where weakest. Both these functions are weighty reasons for making the bridge strong. It should be built of angle-iron, and must be cross-braced to withstand strains in all directions.

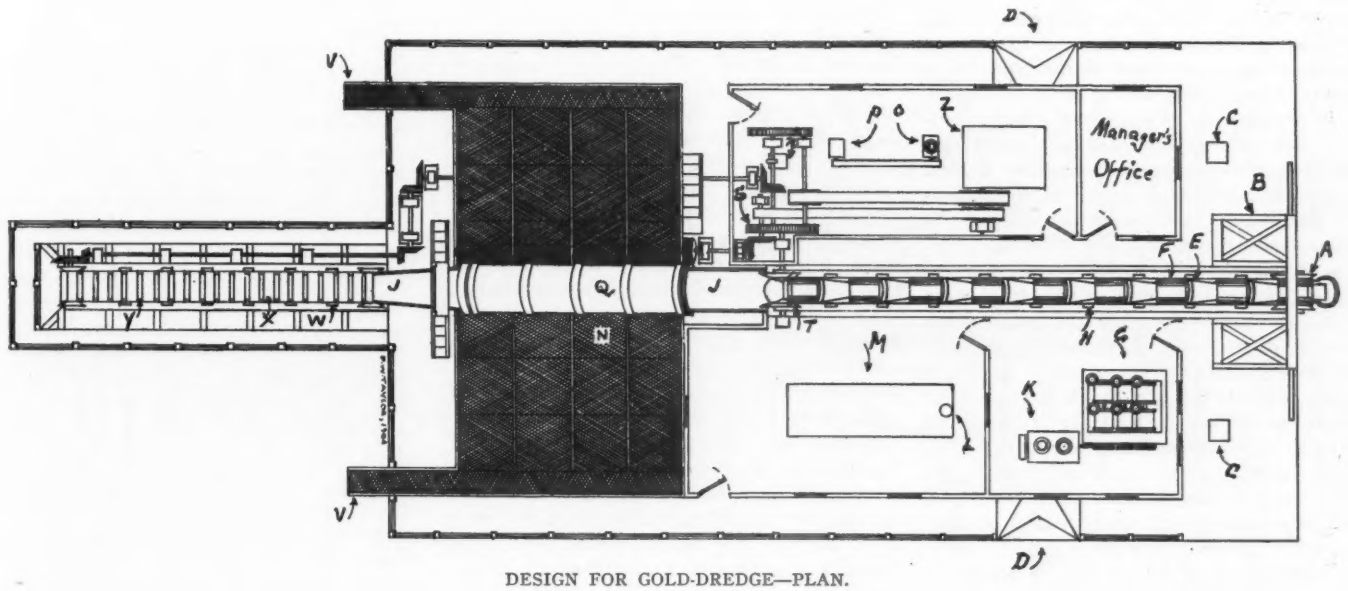
Staying of Elevator.—A head-frame of a height equal to the distance from the center of its base to the top end of the elevator should be built as near the center of the dredge as possible. Steel stays are taken from it to the top of the elevator, and also to the bridge to bear the counter strain. The legs of the head-frame should be of 12 in. by 12 in. hard wood, and may serve as supports for the horizontal beams holding the bearings of the heavy top-tumbler gearing.

Boiler.—A locomotive type will be found the most suitable.

Main Engine.—It will be found convenient and economical to have an engine of compound condensing type. Owing to the irregularity

stand the shock consequent upon the discharge of abnormally large boulders from the buckets. This shock is considerable, owing to the fact that the chute has to be placed some distance below the top tumbler in order to allow the descending buckets to clear. Therefore it is obviously unwise to allow these boulders to drop into the chute at all. The winch-man should stop the buckets and these large stones should be removed to the deck, afterward being dropped over the side behind the cut. It is often deemed advisable to install a separate small winch for this purpose, and also for the removal of buckets from the line when about to undergo repairs. A convenient position for this winch is on the right hand side of the dredge near the bow, where it is near the winch-man.

Gearing to Work Elevator.—The plan shows the bevel gearing for this purpose. In some dredges a belt is led to a pulley at the further end of the tables, which pulley in turn drives the bevel gearing working the top tumbler of the elevator. Since, however, serious extra



DESIGN FOR GOLD-DREDGE—PLAN.

References to Plan.

A. Botton Tumbler.
B. Bridge.
C, C. Forepeak Hatchways.
D, D. Stairs.
E. Bucket.
F. Connecting Links.
G. Winches.
H. Roller.
J, J. Chutes.
K. Winch-Engine.
L. Smoke-Stack.
M. Boiler.
N. Main Engine.
O. Lighting-Engine.
P. Lighting-Dynamo.
Q. Screen.
R. Pump.
S. Crown-Wheel.
T. Top-Tumbler.
V, V. Sluices.
W. Roller.
X. Elevator-Bucket.
Y. Connecting-Links.
Z. Tables.

To assist in their preservation, the timbers should be creosoted, and those parts of the mooring lines which are imbedded in the ground should be tarred.

Rate of Discharge of Buckets.—Two buckets discharge their contents during each complete revolution of the top tumbler, which should move at the rate of 8 rev. per min. This allows for a discharge of 16 buckets per minute. In nearly every dredge I have seen, the maximum rate of discharge was only 8 or 10 buckets per minute. This was a proper working speed, for the dredges were built throughout too lightly for the work they had to accomplish. So long, however, as all machinery (including the buckets themselves), supports, etc., are thoroughly strong and rigid, there is no reason why a maximum of 20 buckets should not be discharged every minute. It is needless to point out the proportionate increase in the amount of gravel handled in the same length of time.

Bridge.—This serves the double purpose of

of the load an exceptionally good governor is an essential feature. It is not an easy matter to mount the engine with absolute rigidity. A concrete foundation is out of the question, but a most satisfactory arrangement of wooden bed is obtained by running 12 in. by 12 in. hard-wood timbers lengthwise under the engine, halving similar timbers into them crosswise, and placing under the framework thus made 12 in. by 12 in. hard-wood legs, cross-braced and strutted in all directions, and built-in with the bottom joists of the pontoon.

The engine is not, of course, to be started on a heavy load, and therefore a clutch must be arranged at some point in the gearing actuating the crown-wheel, whereby the top tumbler may be put into and out of gear. It is found convenient to lead thin wire-ropes, fixed to this clutch, through pulleys to a lever in the winch-room, thereby placing the control of the buckets entirely in the winch-man's hands.

Chute.—It is seldom considered necessary to make the chute sufficiently strong to with-

expense would be incurred in making the tables thoroughly water-tight, the belt, which runs underneath them receives a considerable quantity of water. This results in the belt slipping off the further pulley quite frequently. It is manifestly an advantage, therefore, to employ bevel gearing.

Gear Operating Crown-Wheel.—In a flat plan it is impossible to show with sufficient clearness all details of the gear working the top tumbler. Such details are perhaps, however, unnecessary, since any heavy gearing reducing the known speed of the engine to the required speed of the crown-wheel will answer the purpose. The mounting of the inner bearings of the various shafts in this gearing should be on 12 in. by 12 in. hard-wood timbers mortised, bolted, and braced into the legs of the head-frame. The outer bearings should be mounted on similar timbers also fixed to short auxiliary legs, which in turn must be strongly braced to the legs of the head-frame.

Pump.—The pump may be worked by an eccentric on one of the shafts of the crown-wheel gearing (on which particular shaft must depend the speed required at the pump). The installation of a steam pump, however, though more expensive, gives more convenient control, and if the dredge happens to be temporarily shut down for repairs or for other reasons at any time, does not entail the necessity of running up the main engine for the especial purpose of keeping the supply-tank full. It is necessary to protect the mouth of the suction-pipe with a close-meshed screen, to keep out the innumerable twigs and other foreign bodies which are always present in sluggish streams.

A BENDIGO MINE.

The following interesting particulars, as given by the *Australian Mining Standard*, indicate the excellence of the work done at what is at present the most successful mine in the Bendigo district, Victoria. The data are taken from the half-yearly report of the New Moon Gold Mining Company. During the six months 13,615 tons were crushed, yielding 9,130 oz. 4 dwt., an average of 13 dwt. 10 grains per ton, which enabled the directors to declare dividends to the amount of £24,000, or at the rate of £1 per share. In the previous half-year 13,312 tons were crushed for 7,988 oz. 16 dwt. gold, an average of 12 dwt. per ton, and producing £19,200 in dividends—16s. per share. An interesting statement is given showing the experiences of the company during the past twelve years. For instance, it is set forth that in 1892 there were 4,878 tons crushed for 3,190 oz., enabling the payment of £5,700 in dividends. Since that period the company has steadily disbursed profits among its shareholders, the total amount so divided to December 31 last being £182,400. To secure this profit 223,964 tons, which yielded 95,118 oz., valued at £376,497, were crushed; the average per ton being 8 dwt. 12 grains. In machinery a total of £22,825 was expended during the twelve years. The directors comment on this statement as follows: "It will be noticed that the amount paid in dividends, added to the cost of machinery, represents about 54 per cent of the value of the gold produced. The balance, or 46 per cent of the average yield of 8 dwt. 12 grains per ton (say, £1 14s. per ton), will show that the net cost of working and developing the mine has not been excessive. The dividends during the past 12 months are equal to 63 per cent of the value of the gold produced.

VOLUMETRIC METHOD FOR THE DETERMINATION OF MAGNESIUM.—In a method described by E. Rupp (*Archiv der Pharmacie*, 1903, CCXLI, viii, pp. 608 to 613), the magnesium is precipitated as magnesium-ammonium arsenate in the usual manner by the addition of an excess of sodium arsenate solution of known strength. After filtering off the precipitate, the quantity of uncombined sodium arsenate in the filtrate is measured by iodometric titration in the usual way, from which the quantity of arsenic acid required for the precipitation of the magnesium, and therefore the quantity of magnesium, can be calculated. The method is said to be more accurate than the gravimetric determination of magnesium by precipitation

LABORATORY WORK UNDER SMELTING CONDITIONS.

By K. FRIEDRICH.*

Roasting and smelting tests made in metallurgical laboratories are usually conducted either in muffle or pot furnaces, the charge being held in scorifiers or crucibles. By these methods there is no contact between the material and the burning gases, so that the conditions do not correspond with the treatment of ore in actual practice.

The reverberatory is probably the most widely used in smelting, and it is precisely this type of furnace which, until now, has not been represented in metallurgical laboratories, though the want of it has been keenly experienced in cases where large quantities of ore (several kilograms) were to be treated under conditions resembling those encountered in smelter practice. This induced me to construct a small gas-heated reverberatory furnace, and as the results of the subsequent experiments proved even more favorable than anticipated, I determined to publish the following short description of its construction, efficiency and application. For further details reference may be made to the original account in the *'Zeitschrift für angewandte Chemie'* 1903, No. 36 and 45.

The description will be understood by the help of the accompanying diagrams, Fig. 1 and 2. The body of the furnace, which rests on iron supports, *c*, consists of an iron casing, *b*; this is lined with fire-bricks, *a*, and is open above and below and perforated on all four sides. A replaceable hearth-plate, *d*, which can be either a thick layer of fire-clay placed on an iron plate, *e*, or an iron framework filled out with the hearth material chosen (fire-clay, marl, cement, etc.), forms the floor of the working-chamber, of which the interior dimensions are as follows: 220 mm. high by 350 mm. long and 250 mm. broad. In Fig. 2 is shown a hearth-plate specially adapted for lead-cupellation, the channels and outlets for the overflowing litharge being shown in Fig. 1 at *f* and *f'*. The hearth, which rests on a screw, *h*, connected with a hand-wheel, *g*, may, within certain limits, be either raised or lowered. In order to protect any exposed iron part from direct contact with the flame and also to avoid loss of heat, the space between hearth and walls is smeared with fire-clay.

The principal advantage of this construction is that, owing to the fact that the hearth is removable, both hearth and hearth-material may be chosen to suit any particular process. Moreover, as the hearth is easily accessible and removable, damaged places on the surface can, without difficulty, be noticed and repaired.

There is an aperture, *m*, in the center of the fire-brick plate, *i*, which is bound in iron and provided with handles, *k*, so as to serve as a roof to the working chamber; the aperture may be used either as a means of introducing a pyrometer or as an observation-hole for the assayer.

The openings in the sides of the furnace serve different purposes. In front and on the right-hand side are working openings, n, n_2, provided with fire-clay shutters, o, o_2; the latter have holes for observation, q, q_2, which are in turn provided with stoppers, p, p_2. On the left side of the furnace is a tap-hole, r, and on either side, near the back wall, an opening slanting toward the hearth, s, s_2, for the introduction—when necessary—of air to the surface of the molten metal or slag. Finally there are three channels running from the back wall of the furnace to the working chamber. The heating gas is conducted through the two outer openings, t, t_2, while the middle one, u, serves as an escape for the waste gases.

Before leaving the furnace, the burning gases strike against the opposite wall, thus forming a returning flame (see Fig. 1), this being the only method in which the distance requisite for the full development of the flame before leaving the hearth, can be obtained in a furnace of such small dimensions. Furthermore, as both gas flames are thrown against the same wall and leave by a common exit, a thorough mixing of air and gas takes place, resulting in a relatively complete combustion which, in turn, yields a high temperature. The waste-gases are drawn off through an iron pipe, *v*, lined with fire-clay, and thence through an ordinary iron stove pipe, *w*, into the chimney; a fire-clay damper in the exit-pipe serves to regulate the draft.

The furnace is provided with two large and two small gas burners (Issem *Gasgebläsebrenner*). In both channels the larger burner is placed above the smaller, and each of the four is furnished with a separate tap for the regulation of the supply of gas and air. The advantages of this construction are evident. First, a purely reducing or oxidizing atmosphere may be conducted over the charge by letting only gas or air through the lower burner, while the larger burner above provides the necessary heat. By employing the top burners alone, the flame is drawn up to the roof without coming in direct contact with the material under treatment, the heating therefore being solely effected by radiation (*Heizverfahren mit freier Flammenentfallung*).

The furnace is, therefore, adequate for such experiments as require complete control over the direction of the flames, for it is easily conceivable that by laying small fire-clay wedges on the bottom of the gas-canals and exits the flame will be directed toward the roof, whereas, on the other hand, by either pushing in the damper, lowering the burners or raising the hearth, the flame can be brought as near the charge as desired.

Smelting experiments may be carried out under any desired atmospheric conditions by conducting the respective gases, for example, carbon monoxide, carbon dioxide, etc., through a small nozzle introduced for this purpose in the lower burners, or perhaps more advantageously through the side air-holes. By introducing a mixture of oxygen and air through the above-mentioned nozzle, or by conducting gas simultaneously through all four burners the highest possible temperature may be produced, and by the introduction of more or less air an oxidizing or reducing flame obtained.

The efficiency of the furnace has been fully proved by the following experiments, carried out with ordinary coal-gas, aided by blast generated from a hand-worked cylinder-blowing-engine.

1. Temperature test with Seger cones.—For this purpose 11 cones of different fusibility were distributed over a surface of about 12 cm. sq. in the middle of the hearth. The result of this experiment is shown in the accompanying table:

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TABLE I.

Minutes		20	24	35	45	50
Cone numbers ..		5	7	9	11	12
Temperature		1230°	1270°	1310°	1350°	1370°
Minutes	55	60	70	80	85	90
Cone numbers ..	16	18	20	22	24	25
Temperature	1450°	1490°	1530°	1570°	1610°	1630°

The first row of figures shows the number of minutes which elapsed between the moment of beginning to heat and that at which the points of the cones—in the second row—touched the ground; the corresponding temperatures are given in the third row, in degrees Centigrade.

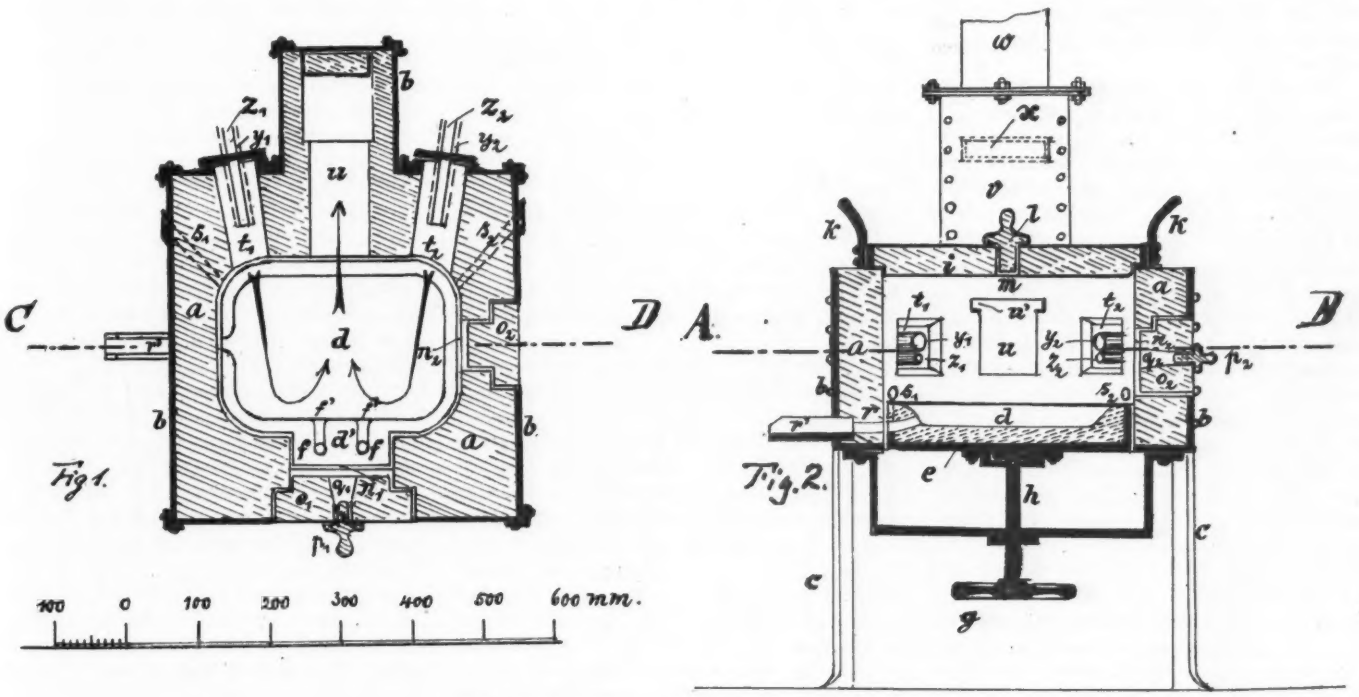
2. In consideration of the fact that Seger cones are not always reliable, a second test was executed with the Le Chatelier pyrometer, which was passed through the opening in the roof, in such a manner that only the protecting tube of the element, which projected 21 cm. into the furnace, touched the hearth. In order to prevent this tube cracking it was necessary to heat very gradually during the first 10 minutes, at the end of which period a temperature of 1,200° C. was attained and full firing could be proceeded with. The results, which are given in Table II, prove the correctness of the first experiment.

TABLE II.

Minutes		10	15	18	22	28
Temperature		1200°	1300°	1350°	1400°	1450°
Minutes	41	48	56	58	62	70
Temperature	1500°	1525°	1535°	1540°	1550°	1555°
Minutes	73	75	78	80	83	90
Temperature	1565°	1570°	1580°	1585°	1590°	1600°

For the above experiments the consumption of gas amounted to 9 cu. m. per hour, which is insignificant in comparison with the exceedingly high temperatures obtained, and by using oxygen instead of air-blast it is to be expected that the flame in the middle of the work-chamber would reach a temperature of about 1,700° C.

In consequence of its construction and efficiency this furnace should be well adapted to many kinds of work. It allows an absolute choice of hearth material and complete control over the heating conditions; it thus provides means of conducting, not only scientific, but also practical experiments. In certain other assay-furnaces temperatures of 1,600° C. and higher are attainable, but in none of them can work be carried on continuously, nor can charges of more than a few grams or at the utmost of 1 kg. be treated, whereas in my furnace single charges of several kilo. may be handled at temperatures up to 1,600° C., and owing to the possibility of work being carried on continuously, its output greatly exceeds that of any other type. Therefore, this furnace will be welcome in iron-laboratories, in cases where it is required to produce larger quantities of alloys, such as nickel-steel, etc., which are not easily fusible. The furnace also can be used as a muffle and wind-furnace. In the latter case the crucibles or pots are placed direct on the hearth-plate, whereby the advantage over furnaces heated with coke or coal lies in the possibility of having the crucibles under continued observation and of regulating the temperature within certain limits. When required a small muffle (85 by 125 by 225 mm.) may be introduced through the front working door, and an experiment proved that 1.5 hours heating produced a temperature of 1,430° C. inside the muffle. Besides being of the utmost importance to assayers, this gas-heated reverberatory furnace offers a new means of study to all interested in this branch of science, being splendidly adapted for demonstrating metallurgical processes—such as lead-refining and cupellation—owing to the fact that the identical circumstances, which occur in smelting, can be reproduced on a small scale.



SMELTING FURNACE FOR THE LABORATORY.

CHEMICAL INDUSTRY OF RUSSIA.—In recent years business has not been good, and prices have suffered from overproduct, making it impossible for many works to declare a dividend. The attempt to improve the condition of the industry by trade agreements has not been much of a success. There are 10 sulphuric acid works, 8 superphosphate factories, and 14 bone glue plants. It is reported that the sulphuric acid works at St. Petersburg, Warsaw, and Moscow, have agreed to divide the consuming territory so as to maintain remunerative prices.

THE ELECTRIC SMELTING OF COMPLEX SULPHIDES.

BY A. A. BEADLE.

The Broken Hill saddle-reef in New South Wales, the oxidized portions of which have been removed and worked, until only the lower sulphide ores are left, consists of an extremely finely interlaced mass of crystals of argentiferous galena and ferruginous zinc-blende, with a gangue of garnet, rhodonite and feldspar, together with traces of arsenic, copper and gold. The average composition of the ore is lead 18 per cent, zinc 20 to 25 per cent, iron 6 per cent, sulphur 20 per cent, gangue 25 per cent, silver 10 to 15 oz. and gold 2 to 3 dwt. per ton, leaving about 10 per cent for moisture. At present about 5 tons of ore having a total metallic value of about $150 are concentrated in order to obtain one ton of concentrates assaying 60 per cent lead and 31 oz. silver. Magnetic concentration has lately enabled a zinc-blende assaying 45 per cent zinc to be produced.

Whichever concentrate is obtained, the fact remains that whereas the miner raises a large value of metal from his mine, he has to be content to convert a small proportion of it into concentrates which he sells to the smelter, while he is forced to send the remaining part over the dump.

The difficulties in the smelting of such complex sulphides as those of Broken Hill are far too well known to require recapitulation here, but the more recent attempts to overcome them by electro-metallurgical methods are not so well understood. The peculiar structure of these ores should be observed; the interlaced crystals of galena and blende vary from the size of a pea to that of a pin's head, so that concentration becomes a variable advantage according to whether they are coarse or fine, and whereas coarse crushing may entirely separate the crystals in one sample, in a second, even when crushed to pass 60-mesh, the crystals of one mineral may enclose those of another. It will be readily understood, therefore, that to get a complete separation of the metals it is necessary to chemically disintegrate or dis-

solve the complex mineral. The suggestions and patents for the electro-metallurgical treatmen of these complex sulphides are too numerous to mention, but a description of the more important methods may prove of interest. These may be classed under two headings: (A) those involving the electrolysis of aqueous solutions and (B) those involving the electrolysis of fused salts. To these might be added those in which modifications of existing processes are involved, the heat being applied by electric energy in place of ordinary carbonaceous fuel; but this method promises little success, it is simply an expensive means of applying heat for reduction purposes, and it will not be considered here.

In processes involving the electrolysis of aqueous solutions certain conditions are necessary: The minerals have to be brought into solution separately, or, if dissolved together, the metals must be separately deposited in a pure and coherent condition. None of these essentials, as a matter of fact, have ever been fully realized.

The principle which has been utilized most frequently in order to bring the metals into solution depends upon the fact that when the complex mineral is partially roasted, a large proportion of the sulphides are converted into sulphates, so that when this partially roasted ore is lixiviated with water or dilute sulphuric acid the sulphate of zinc is dissolved while that of lead remains as an insoluble residue. So many solvents have been tried at different times that the patents may be counted by hundreds; only the most important will be mentioned. A solution of ferric chloride which, when allowed to act upon the roasted ore, converts the zinc into soluble chloride, leaving the lead and silver in the residue (Ashcroft's original process, subsequently modified, but, after an extensive trial, abandoned); the mineral acids which have been usually allowed to act upon the roasted ore; the alkaline bi-sulphates which have been fused with the roasted ore thus converting them into sulphates; and the alkaline hydrates which, heated either in solution or fused with the roasted ore, convert the lead and zinc into soluble plumbates and zincates, leaving the copper and silver in the residue. Although these reactions are correct in their way, and actually take place in practice, the same difficulties arise in every one.

It is useless to obtain a mixed solution of lead and zinc, as they cannot be fractionally deposited; if the zinc is brought alone into solution the residue can be treated for lead and silver, but the zinc cannot be satisfactorily deposited; moreover, the cost of solvents is a large item, and if a cyclical process be adopted the accumulation of impurities soon disturbs the regular working and the cyclic action ceases. In addition, mention may be made of the corrosion of the anode, the low energy-efficiency of deposition and the large capital required for the plant. In spite of these difficulties, however, the large margin of profit in working one of these complex ores warrants a continuation of investigations in this direction, as the following calculation will show. If we take an ore assaying lead 20 per cent, zinc 20 per cent and silver 10 oz. the total metallic value is about $37 per ton. Now, if we take the cost of mining at $3 per ton, the carriage by rail to the Australian seaboard at $3.50, the cost of transport by sea to Europe at $6.25, and the cost of bagging, loading and unloading at $2.50, we find that the margin of profit in Europe would be $22, whereas at the Australian seaboard, while allowing for carriage of the metals to Europe, it would be $28 per ton of ore. This, however, does not allow for miners' rights and profits. The extra margin at the Australian seaboard would probably be swamped by the higher cost of labor, machinery and fuel, so that Europe or the States might prove more advantageous. Again, considering one item alone, which is an essential cost in any wet electrolytic process under almost ideal conditions, the deposition of the lead and zinc from one ton of ore, taking power at a cost of $0.005 per horse-power hour, would be $9.50 at 5 volts and 60 per cent current efficiency, the best to be expected when exhausting the metals from their solutions. If, however, fused electrolysis be substituted, it would be safe to assume a decomposition pressure of three volts and a current efficiency of 95 per cent, for these values have been obtained on a fairly large scale, so that the cost of reduction of the lead and zinc would fall to $4.25 per ton of ore. Thus it may be seen that by wet electrolysis, the possible margin for smelting expenses and profit in Europe is $12.75, while by fused electrolysis it is $18, or nearly half as much again. While the many expenses involved in wet methods are more than sufficient to swamp this small margin and leave only a loss, there is but little doubt that by fused methods, and in view of the increased margin, these ores can be advantageously smelted.

In order that the metals lead, zinc and silver may be reduced electrolytically in the fused state they must be first converted into their haloid salts. Once this is successfully accomplished they can be dealt with almost as desired, for the fused chlorides are readily amenable to fractional electrolysis, and the impurities being removed as a preliminary step, the metals may be reduced in pure marketable condition and even the noble metals removed as a rich lead alloy before the bulk of the lead is reduced. The current efficiency is high, the voltage low, and the size and cost of plant for a given output are considerably lower than in wet processes. The conversion, therefore, either directly or indirectly, of the complex sulphide into the fused chloride constitutes the main part of this problem.

There is one class of reactions which are exothermic, and take place rapidly and completely, that has been much studied in England, Germany and America during the last 10 years, and which is of unquestionable importance to this problem. If these sulphides be heated to a temperature of about 200° C., and chlorine be passed over them, the chlorides of the metals and chloride of sulphur are formed; if the ore be raised to a dull red heat and excess of chlorine be passed over it the same reactions may be noticed; if, however, the ore be in large excess the action is somewhat different, chlorides of the metals and free sulphur are produced, and this latter reaction, discovered by James Swinburne in England, is the one which promises to be of most value, as it not only converts the metals into fused chlorides direct and liberates the sulphur and gangue as such, but, the reaction being exothermic, no external heat is required to bring it about or to prepare the chloride for electrolysis, and the chlorine, when liberated from the anode, is again ready to act upon the ore.

The earlier attempts to convert the sulphide into metallic chlorides took advantage of wet reactions such as dissolving the roasted ore in hydrochloric acid or the treatment of the wet ore with chlorine; but these reactions are slow and incomplete, and are generally unsatisfactory, and they involve the evaporation and dehydration of the zinc chloride, a matter which, unless it is free from all impurities, is a difficult one.

Since the electric current deposits each metal in its equivalent amount, it is only necessary to reduce, electrolytically, the electro-positive metal zinc, secondary reactions being made use of to reduce the several other metals; thus the lead is reduced at the expense of its equivalent of zinc, and silver by its equivalent of lead. This method of procedure obviates the necessity for several electrolytic plants, as zinc only need be produced.

The amount of electrical energy required is exactly the same as it would be if all the metals were separately deposited, the extra voltage required for the zinc manifesting itself as an increase of temperature sufficient to keep the chlorides melted in the replacement vat. Many complications and difficulties have arisen in these processes, but the possibility of the reaction between the chlorine and sulphides forming metallic chlorides and free sulphur, and of the electrolysis of the fused zinc chloride and intermediate reduction of pure lead and silver on a large scale, has been proved beyond question so that great hope of the ultimate success of this departure is reasonably held out.

A somewhat similar line of reasoning has been put forward for a method of smelting based on the ultimate reduction of zinc by ordinary means, but it is nearly as difficult to obtain the zinc in a form ready for distillation in retorts as to obtain it in the form of chloride, seeing that the lead and silver must be in a condition to be reduced by replacement with zinc, and it will be seen that whatever losses occur in the subsequent zinc reduction are doubly felt in the substitution process afterward. It is therefore obvious that in order to smelt a complex ore by a substitution method the whole of the zinc in the ore and that used in replacing the lead and silver must be entirely recoverable without loss, a state of affairs realized by electrolytic methods alone.

TALC BRICKS FOR OIL FURNACES.—A rather novel attempt will be made in California to utilize talc produced locally for making bricks to line furnaces burning oil. Ordinarily these furnaces are lined with magnesite or other refractory material. The consumption of fuel oil is rapidly increasing on the Pacific coast.

SOFT ZINC.—According to the *Metal Industry*, a method of producing soft zinc has been patented in France by the firm of L. Gührs & Cie. Equal parts of zinc and aluminum are melted, to which a small amount of bismuth is added. This alloy is added to molten zinc until volatilization ceases. The zinc is heated to a temperature of from 900° to 1,200° F. It is stated that the zinc so produced is of 99 per cent purity, and, in addition to being soft, it possesses other advantageous physical qualities.

TAILINGS ELEVATORS.*

BY W. H. WOOD AND E. J. LASCHINGER.

On the Witwatersrand, owing to the flat nature of the ground, it is generally necessary to elevate the tailings from the mill, so that the pulp may flow into the vats of the cyanide annex. In cases where the mill is situated at a distance from the cyanide works, it is sometimes even necessary to elevate the mill product twice, in order to obtain the requisite grade for the launders. For this purpose tailings elevators of various kinds are employed.

The subject may be treated under a few distinct headings: (1) Tailings wheels, (2) Tailings pumps, (3) Bucket belt elevators, (4) Air-lift pumps.

Tailings Wheels.—The tailings wheel is first in importance as being most generally in use on the Rand; there are quite a number of wheels of 60 ft. diameter, capable of raising the tailings from 200 stamps. Although the first cost of a large wheel is greater than that of any other elevator, its reliability, durability, and low maintenance cost have caused it to be generally adopted. Most engineers are so conservative that, when once a particular mechanism has proved itself satisfactory to perform a certain duty, they are loath to experiment with others.

As to the mechanical efficiency of tailings wheels, exact data are not at present procurable, but the authors give the following details of a test made on a 25-ft. wheel at the City & Suburban mine. It is generally assumed that this method of raising mill-pulp is efficient, and that there is, comparatively, little loss of power. The test showed: Diameter of wheel, 25 ft.; lift of wheel, 19 ft. 1 in.; tailings and water lifted, 5,549 lb. per min.; theoretical horse-power, 3.208; power actually used to drive wheel, with two intermediate countershafts, taken from motor, 8.847 h. p.; motor efficiency from actual trial, 75 per cent; power delivered by motor, 6.935 h. p.; total power efficiency of wheel and driving mechanism, 48.51 per cent.

It must be noted that as this is a small wheel, and as the driving mechanism involves three speed-reductions from the motor, the efficiency is probably much lower than it would be in a large wheel driven from a mill line-shaft with only a double speed-reduction.

The usual type of wheel on the Rand consists of an outer rim with a continuous inner flange on each side. The vanes are straight and fixed to the inside of the rim, between the flanges (see Fig. 1). The outer rim is supported either by rigid arms or by tension spokes, arranged in pairs and splayed out to give lateral stiffness. The whole wheel is mounted on a heavy shaft and supported on bearings mounted either on masonry piers or on steel or wood structures.

The driving is accomplished either by belt, manila rope, or wire rope. It has been found, after many years' experience, that the method of driving the wheels at the Ferreira Deep, Henry Nourse, etc., has proved satisfactory, that is, by means of 1.75 in. diam. manila rope working round grooves on the rope run of the wheel, and driven from 11 ft. diam. cast iron, ordinary type, grooved driving wheel.

A point that is worth noting in rope-drives is that the grooves in the wheels must be at least 6 in. deep, a precaution which, if taken, will prevent the chance of the rope blowing off in high winds. As an actual proof of the durability of manila ropes on tailings wheels, we may mention that the rope at the Ferreira Deep was put on when the mill first started, over 4.5 years ago, and was only replaced two months ago, and that it actually worked for 3.5 years. This is a great improvement on any work done by the older type of belt drives, which, on the average, we believe, do not last more than about twelve months. Wire-rope drives have been tried, but so far without success. The new 60-ft. wheel at Knights Deep is driven this way, but it has not yet been working long enough for the authors to express an opinion.

Until recently the construction was almost entirely of wood, but the latest wheels are built of steel, all except the lining of the rim and flanges, and the vanes, which are of wood, as being the material best adapted to resist the scouring action of the sand, and as being easily renewable in parts when broken or worn through.

The principle underlying the operation of these wheels is exactly the reverse of the old-fashioned, over-shot breast wheel. The liquid is introduced at the lowest point by a launder delivering into it, then raised up to a point near the top, where it falls out into a receiving launder as the vanes are inverted owing to the rotation of the wheel, thus spilling the liquid out (see Fig. 1).

The calculations necessary to determine the carrying capacity of a tailings wheel are rather complicated, and it is quite impossible to work out exactly on theoretical principles just what maximum amount of pulp a wheel can handle. This is because it is impossible to say how much sand may remain permanently adherent to the vanes, and because the surface of the liquid in the buckets is constantly in motion. When designing tailings wheels for any certain size of mill, the following table is useful in arriving at the amount of pulp to be handled:

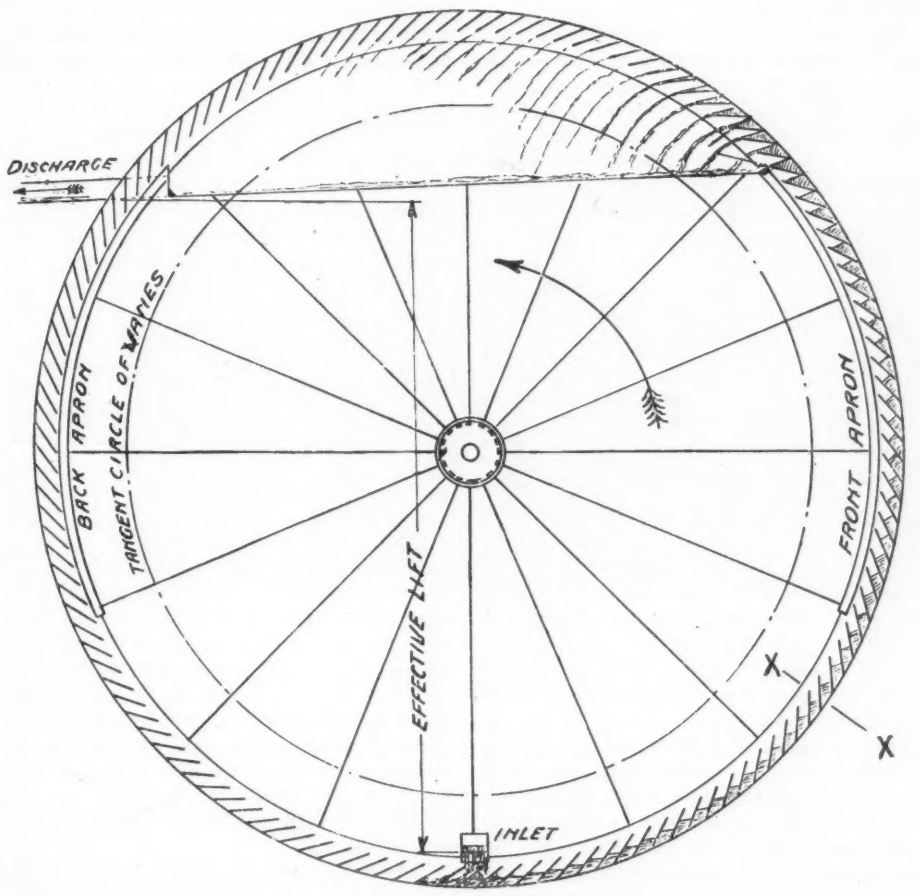


FIG. 1.—SAND WHEEL.

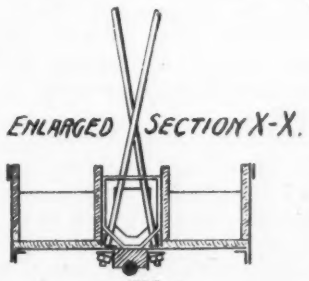


FIG. 2.

Mill Pulp per Stamp per Minute.

Ratio, by weight, water to rock.	Cu. ft. of pulp per minute.	Lb. of pulp per minute.
6 — 1	0.7796	53.472
7 — 1	.9018	61.111
8 — 1	1.0241	68.750
9 — 1	1.1463	76.389
10 — 1	1.2685	84.028

One stamp is assumed to crush 5.5 tons per 24 hours.

A tailings wheel has its maximum carrying capacity when discharging at the level of its axle. That is, if pulp is to be lifted a height of 20 ft., the wheel to lift a maximum quantity of material will have to be 40 ft. in diameter, but practical considerations such as those of cost and efficiency modify this deduction considerably. The cost increases at a greater rate than the ratio of diameter, and it is desirable, especially for high lifts, to discharge at a point as high up on the periphery as practicable, in order to keep down the size of the wheel. To

*Abstract from the *Journal* of the Mechanical Engineers' Association of the Witwatersrand, January, 1904.

meet this requirement the angle made by the vanes with the tangent to the periphery must be so chosen that the vane makes a small angle with the horizontal at the point of commencement of discharge. This is done by making a judicious selection in determining the diameter of the tangent circle of vanes.

The time to be allowed for the buckets to discharge their contents should not be less than 3 sec. for wheels, say, of 40 ft. diam., and about 5 sec. for wheels of 60 ft. diam., that is, the receiving platform should be long enough, or the speed of the wheel slow enough, that the buckets will take the stipulated time to travel over the receiving platform when they are in their inverted position in the upper portion of the wheel.

From theoretical considerations it is evident that the larger a wheel, the greater the ratio of lift to diameter may be, and also that larger wheels may be run at a higher peripheral velocity than small ones. It is evident also that a wheel could be revolved at such a rate that it would not discharge at all, but carry its contents completely round and round, owing to the centrifugal force becoming greater than the weight of the liquid.

The following table of 'critical' or limiting speeds for wheels of various diameters will be of service:

Diam. of wheel in ft.	Rev. per minute.	Peripheral vel. ft. per minute.
10	24.218	761
20	17.125	1,076
30	13.983	1,318
40	12.110	1,522
50	10.830	1,701
60	9.887	1,863
70	9.154	2,013
80	8.562	2,152

The actual speed in practice is, of course, considerably less (generally about one-third of the critical speed, as given in the above table), but it is advisable to run at as high a rate as possible, in order to keep down the weight and cost of the wheel.

From a consideration of the strain diagrams for tailings wheels, it appears that the strain on the rim is independent of the number of spokes, and this is true within the limits of practice; it is also evident that the wheel with rigid arms is to be preferred to the wheel with tension spokes, because the maximum strains are only about half as great in the rigid armed wheel as in the spoke wheel. Practical considerations also point to the advisability of making the wheel with rigid arms, as it is easier to make it run true. The tension spoke wheel looks lighter and prettier, and may, perhaps, be slightly cheaper; but for durability and rigidity the heavy armed wheel is superior and more satisfactory.

The rim of a tailings wheel is generally the weak part in its design and construction, and, owing to the heavy and varying strain, it is more likely to give trouble than any other part of the wheel. It has been suggested by Mr. L. H. Lavenstein to make the vanes of a V shape, with the object of obtaining a cleaner discharge of the heavy sands which stick to the buckets. Mr. Lavenstein has also designed a spokeless wheel which consists simply of a stiff rim, with the usual buckets, guided by rollers, and driven by the friction of driving wheels set under the rim of the tailings wheel, which has continuous railway rails around its outer periphery. The object of this invention is to simplify the driving gear with its usual great speed reduction, and to save the cost of the heavy foundations or framework required to support the bearings of the ordinary wheel. The rim of such a wheel would, of course, have to be very strong and stiff to resist deformation if the wheel were of large size. We do not know of this type of wheel having been actually constructed and put into operation.

(2) *Tailings Pumps.*—Plunger pumps are used on some mines to elevate the mill pulp. They are usually made of the single-acting type with long stroke and comparatively low plunger speed. The plungers must have clean water delivered under pressure behind the gland packing to wash off the sharp sand from the plunger on its return stroke and thus prevent the rapid grinding away of the plunger and gland. The greatest difficulty encountered is that of the scouring of the valve ports and valve chambers by the sands carried in the water. This is minimized, in pumps of good design, by making the ports as large as possible, thus keeping down the velocity of the pulp when passing through them. A certain minimum velocity of flow, however, must be kept up in order to prevent the settling of the pyrite and heavier sands. Removable liners in parts subject to scour are also provided.

A well-designed tailings pump is expensive, because of its size; it is required to handle so large a quantity of liquid that all the parts are necessarily massive. The chief drawback, however, is the maintenance cost, and, more particularly, the loss due to mill stoppage when repairs have to be made. The smallest item is generally the power cost; maintenance costs come next in importance, and the greatest loss is, as mentioned above, the loss in gold recovery, due to stoppages of the mill.

While upon this subject it is well to point out how important it is that every plant should be provided with either a duplicate set of tailings elevators or some other alternative method of raising the pulp while the elevator usually in use is shut down for repairs. It might easily happen that the loss due to a single breakdown in a tailings elevator would more than pay for the installation of the most expensive kind of elevator known, as an alternative for doing this work in case of accident.

Centrifugal pumps have been tried, but those who have had experience are best able to testify to the uselessness of the centrifugal pump for this class of work. The vanes may be scoured away by the sand in a few hours, leaving nothing but the hub remaining on the shaft.

Plunger pumps and centrifugal pumps may be, and are, successfully used for elevating slimes, but when handling mill pulp the sharp grains of quartz cause so much scouring, necessitating so many and frequent repairs, as to render them but poor substitutes for tailings wheels.

(3) *Bucket Belt Elevators.*—Buckets fixed either to link chain or to rubber belts have been tried for elevating tailings. Owing to the sharp sand particles lodging in the moving parts or joints of a link chain, the links are soon cut through. In the case of buckets fixed to a rubber or composition belt the chief difficulty that seems to present itself is that of driving. The belt being continually wet, slips on the pulleys, and if sufficient tension is employed to make the belt grip, the strain is too great and the belt tears apart.

(4) *Air Lift Pumps.*—The air lift or Pohle pump has recently come in for a great deal of discussion as to its adaptability, durability and efficiency as a tailings elevator. That it can be successfully employed for this work has been demonstrated in actual practice. It is used in Australia in a number of mines for raising pulp to a small height.

What its life may be is not so well known. The fluid must be kept moving at a rather rapid rate in this style of elevator, and the scouring action of the sands on the metallic pipes may be so considerable as to require frequent renewals of the piping. It would appear that thick cast-iron pipes would be best to use, or very cheap and durable piping might be made of wood, which has remarkable wearing qualities where scouring action is concerned. There are no valves or moving parts to give trouble, and at first glance this apparatus appears to present many commendable features:

The mechanical efficiency of this device is somewhat disappointing. Sufficient reliable tests have not, so far as we are aware, been made or published to enable one to predict with certainty what efficiency may be expected from any particular pump operating on this principle. Some tests on the Pohle pump for lifting water have been published.[1] From these records it appears that the efficiency is not high (about one-half of that of a pump) and varies with a good many factors, such as ratio of submersion to lift, size of air pipe, height of lift, etc.

The whole question of tailings-elevator arrangements may be summarized thus: Install the most efficient, durable, and reliable elevator to do the regular work, even if the first cost be high. Install a stand-by which is, first of all, reliable, but as simple and cheap as possible; whether it is efficient or inefficient is practically immaterial.

The authors wish, however, to point out that if a well-designed tailings wheel is installed, it is doubtful whether there is any necessity to have a stand-by apparatus, as the satisfactory record of the tailings wheel at the Ferreira Deep illustrates. But if in a large plant two or more tailings wheels are required, and they are not far distant from each other, it will be advisable to install a cheap stand-by, as the risk of breakdown increases in direct proportion to the number of elevators required. The stand-by should then be so arranged as to do the work of either or any one of the tailings wheels.

COAL CONSUMPTION OF ENGLISH RAILWAYS.—The coal consumption of 23 of the principal railways of England, Wales and Ireland for the second half of 1903 shows an aggregate locomotive coal outlay of $11,915,801, as compared with $12,214,565 in the corresponding period in 1902. The saving of $298,764 was largely due to enforced economy. The aggregate train-mileage of 168,404,170 miles compares with a corresponding aggregate of 171,720,894 miles in the corresponding period of 1902, showing that the railways reduced their coal consumption by lessening their train mileage. The average value of the coal consumed by the locomotive upon the railways was 6.98c. per train mile, running in the second half of 1903, as compared with 7.14c. per train mile running in the second half of 1902.

[1] 'Mine Drainage, Pumps, etc.', H. C. Behr, p. 170; *Engineering*, August 17, 1900; and paper by William Maxwell, British Association of Waterworks Engineers, *The Engineer*, August 14, 1903.

A NOTE ON THE CONSTRUCTION OF MINE BULKHEADS.*

By WILLIAM THOMPSON.

The writer was recently called upon to design and erect a number of mine bulkheads which required to be absolutely free from danger of collapse and fracture and possibilities of leakage. After consideration of the many classes of material available for this purpose, and various designs of construction, the following general design was decided upon and followed. The bulkheads were intended to keep out water from some mine workings connected with a shaft of another mine, which had been temporarily abandoned and had filled with water. The mine is in the Rossland district, in British Columbia.

Materials chosen for the erection of the bulkheads were hard-burned, re-pressed brick, manufactured from clay found at Clayton, in the State of Washington; portland cement, imported directly through Vancouver agents from White Brothers, of London, England, and clean river sand, found locally. Before being used, samples of all materials were tested in the laboratories of Dr. J. T. Donald and McGill University, Montreal, Quebec.

In each case the pressure exerted from the head of water to be retained was in one direction. Bulkheads were, therefore, erected in the form of an arch set against footings cut into the solid rock, footings also being cut into the roof and floor of the workings to remove loose or fractured material and make perfect seals against leakage at point of contact between brick-work and walls of drift. The first arch was re-enforced by a second arch of similar design and the space between the intrados and extrados of the final arch was also sealed by strong cement concrete. The extrados of the final arch was also sealed by strong cement concrete faced with 2-in. cedar plank. The strongest and most perfectly shaped brick were chosen for the construction of the main arches and the mortar used consisted of two parts sand to one cement, freshly mixed as required.

Transverse tests of the brick, the distance between centers of support being 6 in., in each case, showed a breaking load at the center of 6,500 lb. for arch brick and 3,900 lb. for face brick. Compression tests showed for arch brick a load of 6,600 lb. per square inch at initial failure, and 8,320 lb. maximum load. For face brick the load at initial failure was 2,117 lb. and the maximum 3,242 lb. The cement test showed a tensile strength in pounds per square inch, as follows: Neat cement, 20 per cent water, at end of 60 days, 699 lb.; one cement and one standard quartz sand, same period, 540 lb.; one cement and one sand used, same period, 489 lb. It must be remembered that these bulkheads were erected to stand the pressure due to a head of 475 ft. of water.

A 3-in. wrought-iron pipe was laid through each bulkhead to carry off water accumulating during construction, this pipe being sealed when water was allowed to accumulate against the face. Bulkheads were maintained free from pressure until material had become thoroughly set.

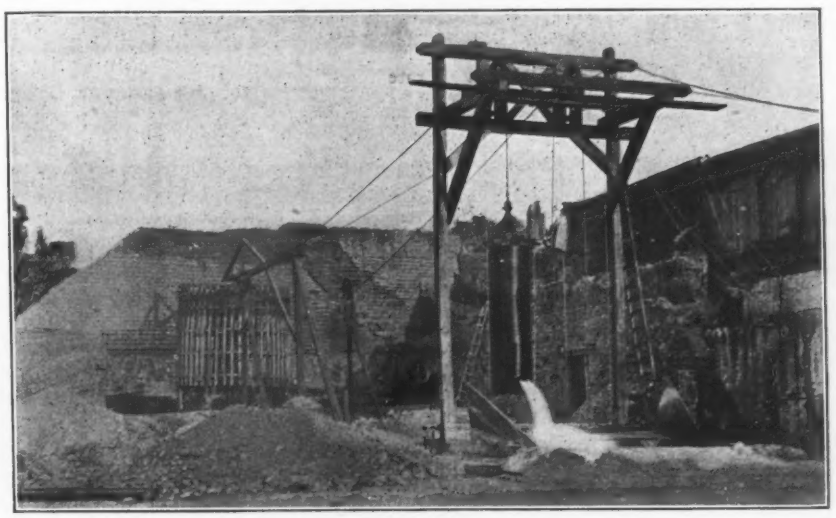
The results obtained proved eminently satisfactory, the bulkheads proving watertight, and, owing to the large factor of safety, they are believed to be free from any danger of collapse or fracture.

*A paper read at the meeting of the Canadian Mining Institute, March, 1904.

A SIMPLE HEAD-FRAME.

The accompanying illustration shows how small an amount of timber is necessary for a head-frame when it is used to good advantage.

In the ordinary 'gallows-frames' used at most Western mines, a simple consideration of the forces involved in hoisting shows that the design is an inheritance, and not one intended to meet the actual requirements of hoisting. There is, therefore, often a great waste of material, which is not a factor of safety because it is not properly placed. In unwatering and reopening mines in the arid region, particularly of Mexico, timbers are expensive, and to meet such conditions the pattern of frame shown herewith was designed by Mr. A. C. Ramsden, for use at Guanajuato, Mexico. The vertical barrel frame used in hoisting by mules is a feature common in Mexico, though seldom seen in the States. The automatic bailer seen in operation was used by the Mexican foreman for some months after purchase as an ordinary bucket carefully overturned by hand.



A SIMPLE HEAD-FRAME—MEXICO.

A NEW COPPER-BEARING AREA IN QUEBEC.*

By JOHN A. DRESSER.

On the latest map of the Eastern Townships of Quebec, issued by the Geological Survey, three areas of pre-Cambrian rocks are indicated. They form nearly parallel belts, which run in a northeast and southwest direction, generally from 20 to 30 miles apart, and are themselves from 2 to 15 miles in width. They usually form conspicuous ridges, which are frequently the highest hills of the district. The intervening areas are occupied by later sediments.

The western and central belts have long been known to be copper-bearing. They have yielded all the copper yet produced in the Eastern Townships, with the exception of that from the Acton and the Huntington mines, and the minor properties in the vicinity of each of these widely different deposits.

In a communication to this Institute in 1902, the writer pointed out that the greater part of these two belts are of volcanic, not sedimentary, origin, as had been previously believed. The view was then also advanced that all of the copper locations of the district of any known, or probable importance, would be found to occur in the igneous portions of these belts, and that those reported from the sedimentary parts of the pre-Cambrian, were likely to be of insignificant value. This view has been fully sustained by the results of two seasons' field work in this region, since been carried on for the Geological Survey.

Of the third pre-Cambrian area, that around Lake Megantic, little is yet known. In the summer of 1902 the writer spent a few days in an examination of the rocks in the vicinity of Lake Megantic. Outcrops were examined and specimens taken for 40 miles along the western edge of the pre-Cambrian area, and in a southerly course across it from Lake Megantic to the Arnold river, near the Maine boundary. The greater part of the rocks thus seen were found to be of volcanic character, like those of the Sutton and Stoke belts. In a cutting 20 rods in length on the Canadian Pacific Railway, near Boundary siding, the rock, which is quite similar to the copper-bearing rock of Ascot, is everywhere rusted by the oxidation of pyrites. In the central part of this cutting, copper and iron pyrites comprise from 5 to 10 per cent of the rock, through a band upwards of 30 ft. in width. Copper is reported to occur in the bank of the Arnold river, south of the village of Chaumay, between Lake Megantic and the boundary line of the State of Maine. Topographically considered, this area seems to be a northern extension of the copper-bearing range of the vicinity of Berlin Falls and Copperville, in New Hampshire.

Further to the eastward, in the highlands of Gaspé, several observers, notably Logan, Ellis and Low, have reported the occurrence of rocks characterized by chlorite and epidote, but no detailed microscopic study of them has yet been made. They are presumably a continuation, or recurrence of this class of copper-bearing traps. Hence it seems probable that the watershed which determines the boundary between the Province of Quebec and the State of Maine, will, as the country becomes accessible for detailed examination, be found to be a continuous ridge, or succession of ridges, of copper-bearing volcanic rocks which may ultimately be connected with the cupriferous pre-Cambrian of New Brunswick.

In view of the prospective opening of this wide extent of country by the projected Grand Trunk Pacific Railway, the actual extent of these rocks is likely to be soon known, and the value of the deposits they may contain becomes a problem of early importance.

*Abstract of paper read before the Canadian Mining Institute, March, 1904.

A NEW SLIME TABLE.

The attention of mill-men has been directed lately to a concentrating table invented by Edwin A. Sperry of Denver, designed for the purpose of recovering valuable slimes. Although a buddle, it is known usually as the Sperry slimer and embodies principles that have long been recognized both in theory and practice. The distinctive feature of the machine is an ingenious combination of both principles in such a manner as to produce a new and distinct type of concentrator, holding the same relation to the ordinary buddle as the Frue vanner does to the old form of canvas-belt machine.

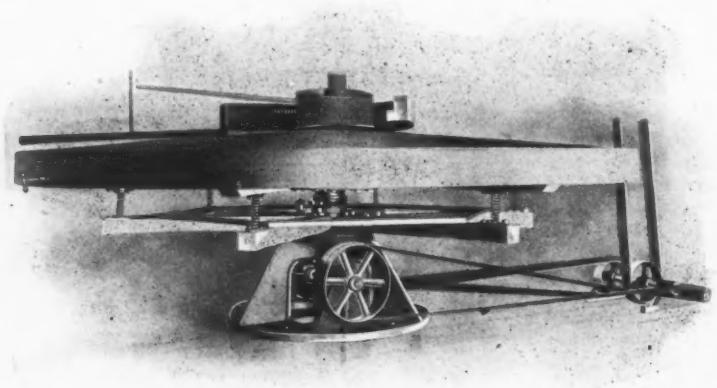


FIG. 1.—GENERAL VIEW OF TABLE.

The general form of the design is a low convex conical table similar to the Cornish buddle, with the addition of a circular vanning motion. The table rotates slowly, passing successively under the feed-box, wash-box and brush-spray pipes, all of which are stationary. By referring to Fig. 2 the general action of the table can be readily seen. The pulp is delivered to a semi-circular feed-box placed at the center of the table. This box is so arranged as to spread the pulp over one-half of the surface, gradually increasing the load from the initial line of feed until the full load is reached. After leaving the final line of feed a space is left for the purpose of completing the stratification, if it is found necessary, before it reaches the wash-water, so that the washing action will simply eliminate the silica. The pulp then passes under the gentle flow of the wash-water, which has just the force required to roll the silica and leave the heavy particles undisturbed. The table in rotating then brings the layer of mineral under the heavy brush-spray, which sweeps it off into the proper launder. This outlines the general action and makes a fuller analysis clearer.

As the pulp is gradually added to the surface it is continuously subject to the circular vanning motion, which has a close resemblance to a perfect panning movement. As a consequence the pulp is, at all points, completely and progressively stratified. The finishing space may be used according to requirements; it is regulated easily by turning the feed-box on its center to any position desired. When the pulp reaches the initial line of the wash-water it is completely stratified, and it is only necessary to apply the wash in sufficient quantity and strength to reach the mean between the rolling points of the silica and the heavy mineral. The pitch of the cone from the center to the edge, being easily and quickly adjustable, can be used with the adjustment of the wash-water, to obtain the required action. This stage of the operation is the one on which the results of the work largely depend; by a proper manipulation and by regulating the size and speed of the circular vanning motion, which is quickly and positively adjustable, a delicate shading of the action is possible.

In some cases it has been found advantageous to use auxiliary spray-pipes in connection with the flow of the wash-water. These are useful, more especially when it is necessary to cut out some gangue of greater specific gravity than the silica and less than that of the mineral to be saved.

The capacity as developed in actual practice is large; under ordinary conditions it is from 10 to 15 tons per 24 hours. This is due to the fact that the entire surface, with the exception of a small space at the center, is available and can be covered with the particles of mineral by the stratifying action of the vanning motion, independently preparing it for the cleaning action of the wash-water. In the common form of buddle the stratification is accomplished by the wash-water simultaneously with the cleaning.

Another advantage claimed is that the table will adjust itself to variable feed. This has been proved in practice and can be demonstrated by theory. In the first place, the machine does not need a 'bed' before it will work normally, any more than a common gold pan needs one. It is simply a matter of distribution and stratification 'in place,' and each particle is practically treated by itself. It follows, therefore, that it makes no difference how many particles are treated, provided that they do not cover the surface with more than one layer, so as to lose the clinging action of the smooth rubber. To illustrate: Assuming that the full load is being handled and the surface is covered with the mineral; the feed is cut to one-half, the stratification progresses as before, the wash-water remains as it was. The action on the pulp will be the same, and the results will not vary.

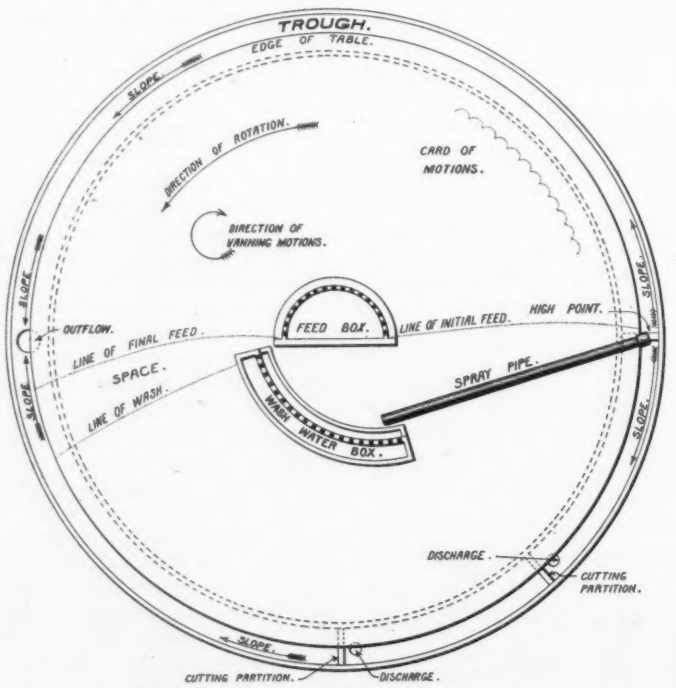


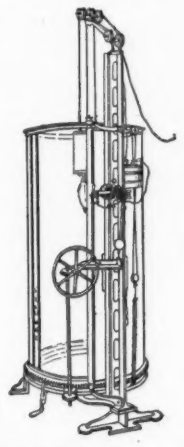
FIG. 2.—PLAN OF CONCENTRATING TABLE.

CONSUMPTION OF MINE-STORES IN THE TRANSVAAL.—The report of the mining department, showing the trade returns of the Transvaal for 1902-3, has just been published, and gives some interesting information in regard to the importation of machinery and other materials for use in the various mines. The imports naturally show a large increase over the previous fiscal year, being valued at £4,673,076, as compared with £1,842,754 in 1901-2. Of the total imports last year, £4,347,243, or 93.03 per cent, represented the value of stores for consumption in the gold mines; £254,831, or 5.45 per cent, the value of stores for consumption in the coal mines; and £24,003, or 0.51 per cent, that for the diamond mines. The remainder, amounting to £46,999, or 1.01 per cent, was imported for the chemical and metallurgical plants. Some of the more important items in the total are: Coal, £750,644; explosives, £586,006; timber, £353,023; cyanide, £201,037; stamp shoes and dies, £40,188; lime, £36,768; zinc, £31,234, and quicksilver, £8,474. The value of stores consumed in the gold mines averaged £1,576 per effective stamp, which compares with £1,034 per stamp in 1898, the year previous to the outbreak of the Boer war.

AN ELECTRICAL BLUE-PRINTING MACHINE.

Those of our readers who do much blue printing will be interested in a new apparatus for this purpose brought out by the Keuffel & Esser Company, New York.

It is a one-lamp machine, and therefore economical, as the one lamp suffices for the largest tracings. The general form of the machine is a vertical glass cylinder, with two printing surfaces. They are 42 by 36 in., 42 by 48; 42 by 60, or 42 by 72 in. Any of these sizes requires a floor space of only 36 by 42 in. The device for placing the tracing and print into position, for insuring good contact and for easily removing tracings and prints is very simple and practical and does not include the tilting of the frame to the horizontal. This greatly lessens the chance of



BLUE-PRINT APPARATUS.

breakage. The lamp, which may be either for direct or alternating current, 110 or 220 volts, is moved by clock work, and can be set to travel at any required speed to any distance, and from and to any height. The current is cut off automatically at the end of the travel of the lamp. The accompanying illustration shows the general form and arrangement of this device.

COAL IN CHILE.—A French consular report states that great quantities of coal exist in the Tertiary measures in the south of the republic, the coal-field extending from latitude 37° to north of Tomé in a long, narrow strip, that is widest in the province of Arauco, where coal is found from the Cordilleras to the Pacific coast. The chief mines are those of Lota, Corinel, Lebu, Laraqueta, Talcahuano and Cerro Verde. The coal from the two latter mines is used to some extent for manufacturing and also for domestic purposes, but its calorific value is too low for steam raising. The coal from the Lebu mine is also inferior, but that from Lota and Corinel is used by vessels in coastwise traffic. This coal contains 50 per cent of volatile matter, and the coke is too light and friable for use in the foundry. No reliable statistics of output are available, but the estimated production is now about 900,000 tons, of which 300,000 tons are taken by vessels touching at Lota and Corinel, and 265,000 tons are distributed at various coast ports. The remainder is consumed locally on railways and in works in the interior. Imports of coal, which have increased during recent years, reached 750,000 tons in 1902. The metallurgical works use large quantities of Australian coke.

RECENT LITERATURE ON ECONOMIC GEOLOGY.—VI. IRON ORES.

By Edwin C. Eckel.

Cambro-Silurian Limonite Ores of Pennsylvania. By T. C. Hopkins. *Bulletin* Geological Society of America. Vol. II, pp. 475-502.

The author discusses the origin and relations of the numerous and extensive limonite deposits occurring in eastern and central Pennsylvania. These ores are associated with the Cambro-Silurian limestones and slates, and are part of a series of similar deposits which extend from Vermont into Alabama, following the Great Valley.

The ores occur as nodules, pipes, shells and irregular masses, mingled with clay and sand; and lie in irregular pocket-like deposits in depressions in the limestone or on an impervious basement of slate or clay. The author concludes that the original source of this iron was the limestones and slates with which the ore-deposits are now associated. He considers that the segregation of this diffused iron into ore lumps was brought about by the action of meteoric waters, aided by organic matter; and that the iron taken into solution by these waters is precipitated largely in the upper beds of the limestone, in cavities or seams, or along the contact of the limestone and slate. As the limestones are dissolved, the masses of ore thus formed settle down with the residual clay.

An average of 29 commercial analyses shows 62.11 per cent ferric oxide, 2.85 per cent manganese oxide, 2.39 per cent alumina, 18.97 per cent silica, 11.62 per cent water; with 1.10 per cent phosphorus pentoxide and 0.06 per cent sulphur.

Iron Ores of the Hartville District, Wyoming. By W. S. T. Smith. Geologic Folio, No. 91. United States Geological Survey.

The iron ores of the Hartville district of Laramie county, Wyoming, occur in a series of quartzites, limestones and schists, called the Whalen group, supposed to be Algonkian. Overlying these rocks unconformably is the Guernsey formation, which consists mainly of limestone with subordinate sandstone beds, and is of Carboniferous age. The basal beds of the Guernsey formation are locally conglomeratic, and contain rounded pebbles of hematite, indicating that the formation of the iron ore-bodies had occurred before the Carboniferous rocks were deposited.

The ores are hematites of two prominent varieties. One, known as "paint ore," is soft, schistose, fine-grained, light red in color. "Blue ore" is a harder, dark-bluish gray, more valuable variety.

All the known occurrences are included in a limited area on the west side of Whalen cañon, beginning at a point about a mile south of Frederick and extending southwest a little over four miles, its western limit being at Hartville, and its southern end about a mile and a half south of Sunrise. Within this area the ore-bodies occur in both limestones and schists, being best developed along and near the contact of the two rocks. In the limestone the ore occurs in irregular, scattered pockets; in the schists, it is in the form of long lenses, varying from a few inches to 100 ft. wide.

The principal body is worked by the Colorado Fuel & Iron Company at Sunrise. The ore is taken out by steam shovel from an open-cut, and averages about 62 per cent metallic iron, with 2.5 per cent silica, and practically no phosphorus nor sulphur. The iron content ranges in places as high as 66 per cent, while the minimum of silica is 1 per cent.

BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of the ENGINEERING AND MINING JOURNAL.

National Academy of Sciences. Annual Report for 1903. Washington; Government Printing Office. Pages, 40.

Electrolytic Copper Refining. By F. J. Schwab and I. Baum. Reprinted from the *Journal of Physical Chemistry.* Pages, 40.

Poor's Ready Reference Bond List. 1904. A supplement to *Poor's Manual of Railroads.* New York; Poor's Railroad Manual Company. Pages, 94.

A Continual Furnace with Automatic Fall for the Torrefaction of Cinnabar. By A. Rabezzana. Florence, Italy; Co-operative Press. Pamphlet, 16 pages.

Alloys of Iron and Tungsten. By R. A. Hadfield. London, England; Reprinted from the *Journal* of the Iron & Steel Institute. Pages, 120; illustrated.

Electrolytic Copper Refining. By Wilder D. Bancroft. Reprinted for the Author from the *Procedings* of the American Electro-Chemical Society. Pamphlet. Pages, 28.

Social and Industrial Condition of the Negro in Massachusetts. Prepared by the Bureau of Statistics of Labor, Chas. F. Pidgin, Chief. Boston; State Printers. Pages, 104.

The Non-Metallic Minerals. Their Occurrence and Uses. By George P. Merrill. New York; John Wiley & Sons. London: Chapman & Hall, Ltd. Pages, 422; illustrated. Price, $4.

Western Australia Geological Survey. Description of Carboniferous Fossils from Gascoyne District. By R. Etheridge, Jr. Perth, W. A.; Government Printer. Pages, 44; illustrated.

The Occurrence of Gold in Great Britain and Ireland. By J. Malcolm Maclaren. Newcastle-upon-Tyne, England; Reprinted from the *Transactions* of the Institution of Mining Engineers. Pages, 86; illustrated.

A Bibliography of the Geology, Mineralogy and Paleontology of Brazil. Prepared from the Records of the National Museum. By John C. Branner. Rio de Janeiro, Brazil; National Printing Office. Pages, 116.

United States Geological Survey. Production of Mica in 1902. By Joseph A. Holmes. Pages, 12. *The Production of Gold and Silver in* 1902. By Geo. E. Roberts. Pages, 12. Washington; Government Printing Office.

Salt briquettes, for export to tropical countries, are being made in Hungary. At the Aussee salt mines a plant is being installed to turn out in 24 hours 40,000 to 45,000 salt briquettes weighing 2 lb. each, and containing not more than 1 per cent moisture. The process consists in subjecting loose salt to a hydraulic pressure of 200 atmospheres.

BOOKS REVIEWED.

The Art of Pattern-Making. By I. McKim Chase. New York, 1903; John Wiley & Sons. Pages, 254; illustrated. Price, $2.50.

The author's purpose in preparing this book has been to furnish a more general and comprehensive treatise on the art of pattern-making than has been available hitherto in technical literature. There is no doubt that the importance of the subject warrants this effort, and we believe the work will render valuable assistance in extending the knowledge of the art. The subjects discussed include some of the most intricate problems with which pattern-makers have to deal.

A Manual of Mechanical Drawing. By Philip D. Johnston. New York, 1903; David Williams Company. Pages, 146; with 69 plates. Price, $2.

This is intended to be a practical book for beginners in mechanical drawing. The instruction is given by means of lessons based upon specimen drawings and arranged systematically with reference to complexity of the problems involved. The lessons are preceded by chapters on geometrical relations, drawing instruments and mensuration, a knowledge of which is necessary to proper comprehension of what follows. The author, who has had experience both as teacher and practical draftsman, is confident that a pupil who has mastered the book will be able to read any drawing and to make the usual run of drawings that come up in the repair shop.

Fortschritte der praktischen Geologie. Vol. 1, 1893-1902. By Max Krahmann. Berlin, 1903; Julius Springer. Pages, 460; illustrated.

The appearance of this volume, the first of a series to be devoted to the subject of economic geology, will be regarded with general satisfaction. As indicated by the title, the book summarizes the progress of the science in the decade from 1893 to 1902, presenting a very full index of the important contributions to the various journals, together with digests of their contents. This information is supplemented by a broad survey of the leading developments during the period mentioned, which has been prepared by the author. A valuable feature of the volume is the series of sketch maps showing the present stage of progress of the various governmental geological surveys.

Quantitative Analysis for Mining Engineers. By Edmund H. Miller. New York, 1904; The D. Van Nostrand Company. Pages, 173. Price, $1.50.

Dr. Miller does not aim to cover the field of inorganic analysis in this book, but to furnish directions for analysis for engineers, particularly those taking the course of mining engineering in Columbia University; and he has embodied in these few pages explicit directions for making these analyses so that the engineer who has a knowledge of chemical analysis can readily apply them. A chapter is given to each of the substances that are likely to come into the scope of the mining engineer's practice, except silver and gold, giving both the gravimetric and volumetric methods; at the end of each chapter is a list of the works that may be applied to for that particular substance, if it is desired to investigate further methods of analysis of this substance, and at the end of the book is a chapter on References to Additional Analysis.

This is a valuable and convenient addition to the literature of inorganic chemical analysis of the more common substances met with in the engineer's profession, and is also valuable as an addition to the analytical chemist's library.

The Kerosene Shale Deposits of New South Wales. By J. E. Carne. Prepared under the supervision of the Geological Survey. Sydney, N. S. W.; Government Printer. Pages, 333; with numerous illustrations and maps.

New South Wales is one of the few countries in which the mining of oil-shales for distillation is still an important industry. Its survival in that country is to be attributed to the favorable geographical situation, which renders less severe the competition with natural petroleum products, and also, in large measure, to the superior quality of the crude material. In fact, the name 'oil-shale' is somewhat of a misnomer, as the material that is mined and distilled resembles cannel coal or boghead more than ordinary shale.

The mineral occurs in seams in the Permo-Carboniferous rocks, usually underlying only small areas, and is found to grade, on the one hand, into coal, and on the other into a carbonaceous shale of earthy or stony texture.

The present monograph gives a very complete summary of the character, origin, occurrence and utilization of oil-shale in New South Wales, with many details as to the history and progress of the industry in other countries. The author has evidently devoted a great deal of attention to the subject, and the results should prove of great value in directing the future progress of the industry.

The Marine Review, of Cleveland, Ohio, makes its issue of March 10 a special number, devoted to a discussion of the shipping question in all its various phases. The list of contributors includes Geo. B. Cortelyou, secretary of the Department of Commerce and Labor; Senator Wm. P. Frye, John McNeil, president of the Brotherhood of Boiler Makers & Iron Ship-Builders of America, and Mr. Winthrop L. Marvin. Hon. T. E. Burton, chairman of the committee of rivers and harbors of the House of Representatives, discusses the system of river and harbor improvements of the Federal government, and points out some radical defects in it. Col. Thomas E. Symons discusses the enlargement of the Erie Canal. Mr. Harvey D. Goulder, counsel for the Lake Carriers' Association, outlines what has been done toward bringing about uniformity in the rules for navigation on the Great Lakes. Mr. W. L. Brown, president of the American Ship-Building Company, discusses the future of ship-building on the Great Lakes. The Panama canal is treated and illustrated. Detailed plans are published of the engines of the two latest United States battleships; also of several other vessels, and of a new dipper dredge for the Canadian government. The edition is illustrated with more than ninety photographs.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the EDITOR.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Electricity vs. Compressed Air.

SIR:—Among other matters of interest that might be discussed with profit by those engaged in the transmission of power, for use in mining operations, there is one that I have not seen discussed in the columns of your valued JOURNAL; that is electricity as against compressed air. No doubt a great number of your readers would be interested in this subject, which is becoming a most important one, and they would be benefited as well as myself by a thorough discussion.

The proposition I would like to see discussed is, Which would give the best and cheapest results for a mine distant about 2.5 miles from the water-power it is proposed to develop. The power to be transmitted, would be about 200 horse power.

P. H. S.

Windsor, N. S., March 14, 1904.

(This question, of 'Electricity vs. Compressed Air,' was discussed in our issues of May 2, May 16 and June 6, 1903.—EDITOR.)

The Kentucky Geological Survey.

SIR:—I send you the following clipping which I took from the ENGINEERING AND MINING JOURNAL, of March 10: "The Kentucky Legislature has revived the State Geological Survey by making an appropriation of $15,000 annually for two years. Prof. C. J. Norwood will act as director, but the chief geologist has not been appointed."

With regard to this clipping I wish to say that the statement that "the chief geologist has not been appointed" is misleading. There will be no "chief geologist" other than the undersigned, who is not without experience as a working geologist, on State surveys as well as in a private station. Under the act providing funds for the curator of the State Geological Department to resume survey work, the curator to be director, or State geologist, the director is authorized to appoint a principal assistant, and such other assistants as may be needed. In the first draft of the Survey bill, some months ago, reference was made to the principal assistant as "chief geologist," the idea being to thus distinguish him from other assistant geologists; but it was soon seen that such expression would not only cause confusion, but that circumstances might decree that the principal assistant should be other than a geologist, hence the limiting words "chief geologist" were stricken out. As a matter of fact, it is not required that any assistant shall be "principal," and whether a principal assistant shall be appointed has not been decided. I write this explanation because applications for positions on the Survey have already been received from other States, and I desire that no misunderstanding shall result from the item above referred to.

C. J. NORWOOD
Director Kentucky Geological Survey.
Lexington, Ky., March 12, 1904.

ABSTRACTS OF OFFICIAL REPORTS.

United States Steel Corporation.

The report of this company contains so much information and covers so much ground that it is difficult to analyze it within the limitations of available space, and only the leading points can be given. The period covered is the year 1903.

The stocks and bonds outstanding at the close of the year were as follows:

Common stock	$508,302,500
Preferred stock	360,281,100
Stocks of subsidiary companies outstanding	109,115
Bonds and debentures, U. S. Steel Co.	468,319,000
Bonds of subsidiary companies	99,819,535
Mortgages and purchase money obligations	5,882,864
Total stocks and bonds	$1,442,714,114

The expenditures by all companies during the year for construction and additions to the property, less credits for property sold, equaled the sum of $31,042,136. Included in this total, however, are outlays amounting to $8,421,189 made on account of the furnaces, steel works and mills of the Union Steel Company, and for the development of that company's coal, coke and railroad properties. The balance of the expenditures, $22,620,947, represents outlays for additions and extensions to the various properties of other subsidiary companies. These expenditures comprehend only actual additions and extensions to the plants and properties.

The total inventories of all properties on December 31, 1903, amounted to $107,976,523, in comparison with an aggregate of $104,390,844 on December 31, 1902, an increase of $3,585,679. This increase is more than accounted for in the item of ore alone, which shows an increase over last year of $7,946,049, or 23 per cent, in inventory valuation, and an increase of 31 per cent in quantity on hand. This increase in the quantity of ore on hand is due partly to the fact that inventories this year include the stocks of the Union Steel Company (not embraced last year), and partly owing to the diminution of ore conversions during the last quarter. As explained in previous reports, it is necessary (owing to the close of navigation on the Great Lakes during the winter) to mine and to ship to furnaces and to storage docks, during the summer and fall, sufficient quantities of ore to insure a supply for the furnaces up to the early summer of the succeeding year. The inventories of commodities other than ore are also increased by reason of including the stocks of the Union Steel Company, to which reference is made above.

Inventory valuations are conservative. They were taken on the basis of actual purchase or production cost of materials to the respective companies holding the same, unless (as happened in some instances) such cost was above the market value on December 31, 1903, in which cases the market price was used. The aggregate inventory valuation of all raw, partly finished and finished materials produced within the organization is very largely below the market prices on December 31, 1903. No profit is taken up by any one subsidiary company on materials and products of its own production until the same have been shipped to customers.

The number of stockholders of the United States Steel Corporation on the respective dates shown below was as follows:

	1903.	1904.
Preferred (Feb., 1904 and 1903)	31,799	42,720
Common (Dec., 1903 and 1902)	26,830	37,237
Totals	58,629	79,957

This shows an increase of 21,328 in the number of shareholders.

The offer to the employees of this corporation and of the subsidiary companies to subscribe for the preferred stock of this corporation was renewed at the end of the year 1903 for the succeeding year, and resulted in a subscription of 10,248 employees for 32,519 shares.

The statement of general receipts and expenses may be given as follows:

Gross sales and earnings	$536,572,876
Miscellaneous receipts	1,720,043
Proportion of earnings of properties separately operated	3,548,550
Total receipts	$541,841,466
Manufacturing and producing costs	$409,268,599
General and selling expenses	16,847,853
Interest of mortgages and current interest	6,553,862
Total expenses	$432,670,314
Net earnings	$109,171,152

The net earnings shown above are the basis of the income account, which is as follows:

Net earnings, as above	$109,171,152
Sinking funds	$1,598,013
Depreciation funds	4,599,822
Replacement fund	9,297,531
Special improvement fund	10,000,000
Interest account	22,880,296
Depreciation in inventory values	5,378,838
Total charges	$53,754,500
Balance, profit	$55,416,652

From the profits there were paid dividends of 7 per cent on preferred and 2.5 per cent on common stock, amounting in all to $43,111,736, and leaving an undivided balance of $12,304,916.

The expenditures made by all properties during year for maintenance, renewals and extraordinary replacements equaled the sum of $34,785,191. This entire amount has been charged to current operations. The physical condition of the properties has been not only fully maintained, but largely improved and strengthened by these extensive outlays, both in respect to increasing the productive and operating capacity and reducing operating costs. The expenditures for extraordinary replacements in 1903 exceeded those for 1902 by $5,012,985.

The products for the year are stated as follows, in tons:

	1902.	1903.
Iron ore mined—		
From Marquette range	1,487,370	1,412,402
From Menominee range	2,675,754	2,106,443
From Gogebic range	2,064,492	1,867,856
From Vermilion range	2,057,537	1,918,584
From Mesaba range	7,778,026	8,058,070
Total	16,063,179	15,363,355
Coke manufactured	9,521,567	8,658,391
Coal mined, not including that used in making coke	709,367	1,120,733
Limestone quarried	1,313,120	1,268,930
Blast furnace products—		
Pig iron	7,802,812	7,123,053
Spiegel	128,265	121,779
Ferro-manganese and silicon	44,453	34,409
Total	7,975,530	7,279,241
Steel ingot production—		
Bessemer ingots	6,759,210	6,191,660
Open-hearth ingots	2,984,708	2,976,300
Total	9,743,918	9,167,960
Rolled and other finished products for sale—		
Steel rails	1,920,786	1,934,315
Blooms, billets, slabs, sheet and tin plate bars	782,637	493,292
Plates	649,541	519,713
Merchant steel, skelp, shapes, hoops, bands and cotton ties	1,254,560	997,595
Tubing and pipe	744,062	795,821
Rods	109,330	101,699
Wire and products of wire	1,122,809	1,126,605
Sheets—black, galvanized and tin plate	783,576	855,213
Finished structural work	481,029	469,692
Angle and splice bars and joints	139,954	138,709
Spikes, bolts, nuts and rivets	42,984	53,259
Axles	136,787	119,716
Sundry iron and steel products	29,177	30,059
Total finished products	8,197,232	7,635,690
Other products—		
Spelter	23,982	23,841
Copperas	14,224	15,407
Cement, bbls.	486,357	644,286

The average number of employees in the service of all companies during the fiscal year 1903, in comparison with the fiscal year 1902, was as follows:

Employees of	1902.	1903.
Manufacturing properties	125,326	123,397
Coal and coke properties	16,519	17,873
Iron ore mining properties	13,465	13,768
Transportation properties	11,160	11,033
Miscellaneous properties	1,657	1,638
Total	168,127	167,709

The total amounts paid in wages and salaries were $120,528,343 in 1902, and $120,763,896 in 1903.

The report says: "In accordance with the policy pursued by the Corporation since its organization, substantial progress was made during the fiscal year last ended in the consolidation of its subsidiary interests. On April 1, 1903, The Carnegie Company, American Steel Hoop Company and National Steel Company were merged under the charter of the last named, the name being subsequently changed to Carnegie Steel Company. On the same date a merger was effected of the H. C. Frick Coke Company, McClure Coke Company, United Coal & Coke Company, Southwest Connellsville Coke Company, American Coke Company and Continental Coke Company, the new company retaining the name of H. C. Frick Coke Company. Thus two corporate operating organizations replaced nine previously existing. On December 31, 1903, the interests of the American Tin Plate Company and the American Sheet Steel Company, were united through the purchase by the latter of the property of the former. The name of the American Sheet Steel Company has been changed to American Sheet & Tin Plate Company.

"The Union Steel Company properties acquired as of December 1, 1902, have been leased to various other subsidiary companies operating similar lines of manufacture. This entails no additional administrative expense to the lessees. The entire net revenue from the operations accrues to the Union Steel Company.

"On November 1, 1903, the United States Steel Products Export Company, whose stock is held by the Federal Steel Company, made arrangements to act as selling agent for all subsidiary companies. The result has been an increase in the export trade.

"During the year general trade conditions materially changed, and the business of the subsidiary companies, in common with the business of all others, suffered by reason of the falling off in orders. The effect upon profits has been shown accurately from time to time in the published statements. So soon as it became evident to the directors that there was likely to be a large diminution in the net profits to be realized by way of dividends from subsidiary companies, it was deemed wise and prudent to reduce the dividend on the common stock of this Corporation, and later for the same reason to suspend payment of dividends on this stock. In the determination of these questions the directors gave careful consideration to all the facts and circumstances bearing upon the subject and due regard to the relative rights and claims of all who are interested in the continuous and permanent success of the Corporation and the advancement of its business.

"On December 31, 1903, the tonnage of unfilled orders on the books was 3,215,123 tons

of all kinds of manufactured products, in comparison with a tonnage of 5,347,253 at corresponding date in the previous year."

Daly-West Mining Company.

This company operates an important mine in the Park City district, in Utah. The report is for the year ending December 31, 1903.

The mine statement shows total development work amounting to 13,202 ft. The production of first-class or shipping ore during the year was 62,346 dry tons, and of second-class or milling ore 76,240 tons. Work has been begun on sinking a shaft from 1,400 to the 1,700-ft. level. A new boiler house was built and two boilers, 550 h. p. in all put in.

The receipts and expenses for the year were as follows, the averages being based on the total tonnage mined:

	Amount.	Per ton.
Ore sales	$2,382,258	$17.19
Sundry accounts	5,973	0.04
Total receipts	$2,388,231	$17.23
Mine account	$461,580	$3.33
Prospecting	100,135	0.72
Ore expenses	105,722	0.76
Mill account	79,002	0.57
General expenses	51,301	0.37
Mine construction	14,913	0.11
Mill construction	17,407	0.13
Sundry charges	26,691	0.19
Total payments	$856,751	$6.18
Net balance	$1,531,480	$11.05

Dividends paid amounted to $1,332,000, leaving a surplus of $199,480. Adding the balance of $255,516 brought forward from previous year, made a total surplus of $454,996 at the close of the year.

The statement of ore sales and values is as follows:

	Crude.	Quincy crude.	Concentrates.	Total.
Ore sold, dry tons	44,476	17,870	16,580	78,926
Gold, oz.	1,686	854	655	3,195
Silver, oz.	2,602,448	886,443	893,331	4,382,222
Copper, lb.	1,898,873	587,456	674,495	3,160,824
Lead, lb.	18,171,587	6,156,898	10,414,306	34,742,791
Zinc, lb.	13,937,865	2,762,337	5,873,153	22,573,355
Sale value	$1,373,103	$416,738	$592,417	$2,382,257
Average value per ton	$30.88	$23.32	$35.73	$30.18
Gold, oz. per ton	0.038	0.048	0.040	0.041
Silver, oz. per ton	58.51	49.61	53.88	55.54
Copper, per cent	2.1	1.6	2.0	2.0
Lead, per cent	20.4	17.2	31.4	21.1
Zinc, per cent	15.6	7.7	7.7	14.3

The mill statement shows that 76,240 dry tons of crude ore were treated during the year, an average of 237 tons a day, the mill having been in operation 321 days. The concentrates turned out were 16,580 dry tons, showing a concentration of 4.6 tons into one. The average assay value of the tailings was 0.319 per cent lead, and 4.046 oz. silver. The actual saving effected was 97.9 per cent of the lead and 72.3 per cent of the silver.

Improvements made included a new ore house, with a capacity of 2,000 tons; this includes conveyors for delivering the ore from the bins directly to the mill and no hand work will be required. Work was begun on a new tailings plant, which will contain a Huntington mill for re-grinding, seven slime settling and classifying tanks, two jigs for treating the coarser tailings, six concentrating tables and one Wilfley slimer. With this plant it is expected to re-concentrate the tailings from the present mill so cheaply that a small profit can be secured chiefly by increasing the saving of silver. A new power and electric plant was added to the mill.

With the additional power and the advantages gained by sorting the ore. it is expected that the building plant will be able to treat at least 10,000 tons of ore per month.

The total amount paid in dividends, as shown above, was $1,332,000, the monthly dividend having been increased from 60 to 65c. per share.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Tripoli.—What are the chief uses of tripoli in its crude and manufactured forms? Who are the chief users, or dealers?—J. N.

Answer.—Tripoli is used largely as an abrasive, and as polishing powder for metals. It is made up in various forms for sale as a polish. It is also used in filtering liquids, and, on account of its absorptive qualities, in making blotting paper. Large dealers are Hammill & Gillespie, 240 Front street, New York; John C. Wiarda & Co., Brooklyn, N. Y.

Mexican Export Duties on Metals.—Please advise us what are the Mexican export duties on gold, silver, copper and lead.—T. V.

Answer.—The duties on the precious metals—gold and silver—are as follows: Federal taxes, which include (1) a coinage duty of 2 per cent; (2) a stamp duty of 3 per cent, and (3) Government assayer's fee of $2.50 per bar of 35 kg., or a fraction thereof; State taxes which include (1) an export duty of 2 per cent and (2) a stamp duty levied by the Federal government of 25 per cent on the State export duty of 2 per cent.

It is also important to note that for the purpose of collecting the Federal taxes, silver is valued at $40.195 per kg., and the gold at $675.416, in addition to which the rate of exchange on gold for the first 15 days of the previous month is added to the gold valuation and the duties collected on that sum. The different States have various valuations for gold which include exchange.

There are no export duties on copper and lead, as such. Nearly all the lead and copper exported from Mexico is in the form of bullion, carrying gold, or silver, or both. Such bullion has to pay taxes on the precious metal contents, as determined by assay.

Barytes.—I should like some information as to the commercial uses of barytes and the present market for the same; as to where the present supply is obtained; the quantity produced with reference to the market demand, and the present market price.—F. M.

Answer.—The exact figures for the production of barytes in the United States in 1903 are not yet available. In 1902, there were 58,149 short tons produced in the United States, and 7,836 tons imported, making a total supply of 65,985 tons. The production for 1903 was probably 5,000 tons greater than that for 1902. The barytes imported is chiefly from Germany. The native barytes comes from Virginia, North Carolina, Tennessee and Missouri. From the figures given it will be seen that the quantity produced is slightly less than the demand. Current prices for barytes vary from $7 per short ton, New York delivery, for crude, up to $18 per ton for the best floated or refined.

The chief use of barytes is as pigment; for this purpose it is mixed with other substances, usually with white lead. In this country its employment for this purpose, especially with white lead, is considered as an adulteration, and is regarded as depreciating the value of the paint. In Europe its use is fully recognized, and for many purposes it is considered a useful and excellent addition. Its insolubility in acid will often render a mixture of barytes with white lead more elastic and less subject to discoloration than the pure white lead. It is believed also to give greater body to the paint and to resist the influence of the weather better than the white lead alone. A small quantity is used here in giving weight and body to certain kinds of paper, and some is sold for use in preparing canvas covers in which hams and other salt meats are packed for market, the canvas thus prepared resisting atmospheric influences and protecting the contents of the package better than that prepared in any other way.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

Duty of Mining Company Regarding Unexploded Charges.—Where a mining company let a contract for the driving of a tunnel in its mine, it was, in view of the hazardous nature of the mining occupation, and the well-known possibility of missing blasts, the duty of the company to keep itself advised in that particular as the work progressed and keep watch of the location of charges and of the condition following the explosions and so, be in position to inform an employee subsequently employed of the location of unexploded charges.—McMillan v. North Star Mining Company. (73 *Pacific Reporter,* 685); Supreme Court of Washington.

What the Law Requires in Respect to Care Between Employer and Employee.—An instruction that the mere fact that an employee was at the time of an accident in the employ of the defendant company did not imply an obligation on the part of the defendant to take more than ordinary care for the safety of such employee; that it was only bound to use ordinary care, and the plaintiff was also bound to use ordinary care for his own safety, and that the law required that both parties should use ordinary care, states clearly and correctly the duty in respect to care which the employer and employee owe each other.—Illinois Steel Company v. Wierzbicky (107 *Illinois Appellate Court Reporter,* 69); Appellate Court of Illinois.

Liability of Mining Company to Attorney Under General Engagement.—A mining company contracted with an insurance company that the latter should defend suits against the former for personal injuries and, up to a certain amount, pay the judgments thereon.

Afterwards the mining company retained an attorney generally, and agreed to employ him in all cases which might come up; the attorney having no notice of the contract with the insurance company. The court held that where a suit for personal injuries was brought against the mining company and the services of such attorney were refused, the company was liable for the damages sustained by the lawyer by such breach of contract, and he had a right of action on same without waiting the result of the personal injury cases in order to sue.—Watson v. Columbia Mining Company. (45 *Southeastern Reporter,* 460); Supreme Court of Georgia.

ERRONEOUS INSTRUCTION REGARDING EVIDENCE AS TO CUSTOM IN MINE.—In an action by an employee in a coal mine for injuries sustained, owing to the fall of slate from the roof of an entry, the court instructed that evidence had been introduced tending to prove a custom that a miner should look after the safety of the roof, but that the evidence should not be considered as tending to prove absence of want of negligence on the part of the company, and that the plaintiff had introduced evidence tending to show the custom of miners, which evidence should not be considered as absence of negligence on the part of the miner. The court above held that the instruction was erroneous, since it deprived the company of the benefit of its evidence as to custom, and negatived the idea that if the company owed no duty as to the roof it was not negligent, no matter what it omitted, and might have led the jury to believe that the evidence as to custom had no bearing on the issue as to negligence or contributory negligence.—Thayer v. Smoky Hollow Coal Company. (96 *Northwestern Reporter,* 718); Supreme Court of Iowa.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending March 15, 1904.

754,417. STONE-CLEANING COMPOSITION AND METHOD OF MAKING SAME.—Philip J. Brahen, Hartford, Conn., assignor to American Restoring Company, Hartford, Conn. A method of compounding a cleaning composition for stone and marble which consists in mixing together 12 parts of chloride of lime and 4 parts of whiting, then dissolving one part of sodium chloride and 16 parts of sodium carbonate in about 66.7 parts of boiling water, then pouring the same over the chloride of lime and whiting and slowly stirring the same.

754,459. RETORT FOR MAKING GAS AND COKE.—Anthony C. Kloman, Pittsburg, Pa., assignor of one-half to James Scott, Pittsburg, Pa. A coke-retort chamber having means for applying heat thereto, said chamber having a bottom inclined in both directions from a middle angular ridge and discharge-openings at the ends of said inclined bottoms, the tops of said openings extending to a level above the ridge, and doors closing said discharge-openings.

754,474. PROCESS OF MAKING NITROGEN COMPOUNDS FROM ATMOSPHERIC NITROGEN.—Hermann Mehner, Steglitz, near Berlin, Germany. A process of manufacturing nitrogen compounds from atmospheric nitrogen which essentially consists in providing a permeable mass of carbon, causing an incandescent-fluid heat-carrier obtained by igneous fusion from solids to percolate through, and simultaneously causing a current of atmospheric-nitrogen-carrying gas to penetrate into, said mass, both in the presence of alkaline matter, withdrawing the nitrogen compounds formed from the zone of reaction, and returning the heat-carrying fluid to the top of the carbon.

754,475. DUMP CAR.—Otto W. Meissner, Chicago, Ill., assignor to Rodger Ballast Car Company, Chicago. In a convertible dump-car, the combination of a supporting-framework, a V-shaped hopper portion extending lengthwise of and below the same with its apex at or near the longitudinal center of the car and formed in two portions—a lower V portion and an upper foldable portion secured to the supporting-framework of the car above the same so as to form a portion of the inclined sides of the V-shaped hopper when in one position and a part of the flat platform of the car in a second position, and swinging sideboards pivotally secured to the framework of the car and adapted to form the sides of a dumping hopper-car or be swung outwardly and downwardly to permit the formation of a platform-car.

754,480. EXCAVATING-MACHINE.—John D. Moran, St. Paul, Minn. The combination with a suitable framework, of an inclined runway having fulcrum-support therein, endless chains carried by said runway, scoops connected by auxiliary chains to said endless chains, means for actuating said endless chains, and an adjustable connection between said runway and framework.

754,546. COAL-ELEVATOR.—John Deady, Jr., Ware, Mass. In a coal-elevator, the combination, with a wheeled frame, of an elevator supported in an inclined position by said frame, an inclined trough secured to the frame at the lower end of the elevator, bars slidable at the sides of the trough, wedge-shaped cross-bars extending between the said bars, and driving mechanism which reciprocates the said bars and operates the elevator.

754,550. MANUFACTURE OF ARTIFICIAL STONE.—Frederick W. Dunn, Woodstock, Canada, assignor of one-half to Neil McPhedran, George L. Whitney, Jacob Henry Frank and Henry John Finkle, Woodstock, Canada. In a mold for the manufacture of artificial stone the combination of a bottom member, a mold-box therefor consisting of side and end members hinged together and arranged to be opened and closed laterally during the use of the apparatus, grappling members secured to the side members of the mold-box, to engage the bottom members and secure the mold-box thereto when the parts are in their assembled position and a locking device to securely hold the side and end members of the mold-box in their closed position.

754,579. DRILL OR PUMP ROD GRAPPLE.—James Luke, Eskridge, Kan. A grappling device consisting of spaced resilient arms terminating in inwardly-extending claws and provided with longitudinal slots, and a bar movably disposed in said slots and provided with notches for engagement with the walls of said slots to maintain said bar in distended position, said bar having spaced barbed arms depending therefrom between the bar and claws.

754,592. DIGGING AND LOADING MACHINE.—Daniel McDonald, Bruce Mines, Canada. The combination of a movable truck or platform, a swing-

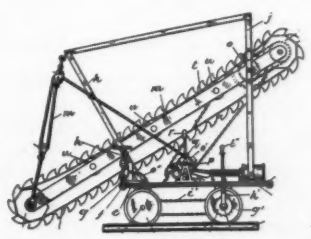


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table mounted thereon, a worm-shaft for the swing-table, a rack connected to the movable truck or platform meshing with the worm-shaft, a pinion-shaft, intermeshing bevel-pinions mounted on the pinion-shaft, worm-shafts, a main frame supported by the swing-table, a carrier-frame journaled at one end to the main frame, an adjustable gear for raising and lowering the other end of the carrier-frame, drums mounted in the carrier-frame, a carrier-belt passing around the drums, buckets connected to the carrier-belt, a sprocket-wheel for driving the carrier-belt, a motor and means for transmitting motion from the motor to the sprocket-wheel.

754,611. SUBMARINE DREDGING AND SLUICING DEVICE.—Robert G. Riley, Seattle, Wash. A submarine dredging and sluicing device comprising a tubular sluice-box adapted to be dragged along a subaqueous bottom and having the wall at the head end flaring outwardly entirely about the box to provide an expanded mouth, traction-wheels supporting the box at the head end, a scoop at the lower edge of said mouth, an endless conveyer in said mouth and extending between said scoop and box, means to operatively connect said wheels with said conveyer, and a gate mounted at the tail end of said box.

754,626. MOLD FOR METAL-CONCRETE CONSTRUCTION.—Carl Weber, Chicago, Ill., assignor to Steel-Concrete Construction Co., Chicago. A set of molds for the purpose set forth, comprising an outer mold and an inner mold each composed of a series of sections provided with means for releasably locking them one to another, and two intermediate molds to co-operate, respectively, with said outer and inner molds, each comprising a series of edgewise-abutting sections.

754,636. STEAM-HAMMER.—Charles E. Billin, Chicago, Ill.—A steam-hammer comprising a frame or casting having a flat rear portion formed to be secured to a wall or column, and having attached thereto a cylinder, and guides for the movable parts, a hammer, a spring-buffer to limit the upward movement of the same, and operating mechanism for admitting working fluid into the cylinder and reciprocating the hammer.

754,639. APPARATUS FOR MAKING BLOCKS FOR BUILDING OR LIKE PURPOSES.—John Brower, San Francisco, Cal. In combination, a mold-box made up of separable members, a removable die within the box on one side, openings in the two adjacent sides of the box, means for forming an opening in the material and compressing the said material within the box and against the die and means for the insertion of a sand filler into the opening in the material.

754,640. METHOD OF MAKING BLOCKS FOR BUILDING OR LIKE PURPOSES.—John Brower, San Francisco, Cal. A process of forming building blocks and the like of cement or like material, consisting in shaping the mass of material, forming an opening or openings therein and thereby simultaneously compressing the material, introducing a sand filler or core into the opening or openings and allowing the mass to dry.

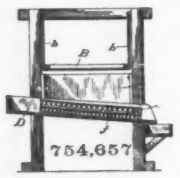
754,643. PROCESS OF SEPARATING IRON PYRITES FROM ZINC-BLENDE.—Karl Danziger, Zawodze, near Kattowitz, Germany. A process for separating iron pyrite from zinc-blende, which consists in exposing the zinc-blende to the action of air moisture and heat and extracting the ferrous salt, which has been formed by the oxidizing action of water.

754,647. PROCESS OF MAKING CYANIDES AND NITRATES.—Willis E. Everette, Tacoma, Wash. A process of forming cyanides and nitrates which consists first in reducing a mixture of pulverized material containing carbon to an intense crymic condition by contact with liquid air; second, subjecting said mixture while still in said intense crymic condition to contact with intense heat in the form of incandescence thereby producing a violent disruption of the elements contained in said mixture, and, third, collecting the cyanides, acids, ammonia, nitrates and other nitrogenous derivates formed by the union of the nitrogen of the air with the disrupted elements separated by said explosion and preparing them for commercial use.

754,656. ELECTRIC FURNACE.—Charles A. Keller, Paris, France. In a double electric and continuously-operating metallurgic furnace in which the upper furnace, formed as a stack-furnace, is designed for the reduction of metal and in which the lower furnace of the ordinary kind, pierced at its upper part by a conduit located below and in the prolongation of the charging-column of the upper furnace is designed for refining, purifying or alloying metals, a chamber of fusion of the upper furnace with a charging-column located at the central part of its roof, openings pierced around the charging-column in the roof of the chamber of fusion of the upper furnace, and vertical electrodes in two parallel series, passed through the openings in the

roof of the chamber of fusion, the lower extremities of these electrodes being situated in the interior of the chamber of fusion and their upper extremities, exterior to the said chamber of fusion, being carried each by a suspension mechanism by the aid of which they are capable of being vertically displaced and removed.

754,657. GOLD-SEPARATOR.—August C. La Bud and Henry J. Barton, Oakbar, Cal. In a gold-separator, the combination of a sluice-box, and a plu-


754,657.

rality of sets of inverted-L-form riffles therein, the lower set of riffles lying on the bottom of the sluice-box and slightly spaced from each other, and the upper set directly overlying said lower set and having its riffles more widely spaced from each other than those of the lower set.

754,667. PROCESS OF MAKING LEAD SALTS.—Walter Mills, London, England, assignor to A. O. Granger, Cartersville, Ga. A method of making salts of lead which consists in dissolving lead-carrying substances in hydrofluosilicic acid to form silicofluoride of lead, and in then reacting upon such silicofluoride with a nitrate to form nitrate of lead.

754,668. PROCESS OF MAKING AMMONIUM NITRATE.—Walter Mills, London, England, assignor to A. O. Granger, Cartersville, Ga. A process of making ammonium nitrate which consists in first forming silicofluoride of lead; then converting the same into the nitrate; and finally reacting upon the nitrate of lead with fluoride of ammonium.

754,687. APPARATUS FOR REFINING CRUDE PETROLEUM.—James M. O'Neall, Dallas, Tex., assignor to British American Power Company. Apparatus for refining crude oil comprising means for converting the volatile oil into vapor by heat, a receptacle for collecting and separating the vapor and the non-volatile matter, a condenser for converting the vapor back to oil, and means for forcing the vapor into a fluid in the condenser.

754,732. AUTOMATIC SILT AND SAND SEPARATOR.—Charles Allen, El Paso, Tex. In a settling apparatus, the combination with a conduit-section having a side opening forming a lateral discharge, a second conduit-section having a side opening presented toward the discharge of the first section, said sections being separated from each other, and a fluid-container forming a transverse continuous connection between the discharge of one conduit-section and the inlet of the second section, of a subjacent tilting tank having communcation with said container, and having a valve-controlled sand-discharge automatically governable in unison with the oscillations of said tank.

754,741. FASTENING DEVICE FOR DRILL-BITS OR THE LIKE.—Charles P. Brintzinghoffer, Howard, Kan. A fastening device, comprising two detachably-connected members, and means for automatically tightening the joint there between in opposition to forces tending to separate said members.

754,756. PROCESS OF SEPARATING ORES FROM MAGNETIC GANGUE.—Thomas A. Edison, Llewellyn Park, N. J. A process of treating magnetic ores carrying a small proportion of a non-magnetic material to be recovered, which consists in grinding the ore to a sufficient fineness to free the non-magnetic particles, in adding thereto a predetermined and larger bulk of a coarser non-magnetic material, in subjecting the mixture to the action of a magnetic separator whereby the non-magnetic material to be recovered, together with the added coarser material, will be rejected as tailings, and finally in separating the added coarser material from the original non-magnetic material.

754,773. APPARATUS FOR THE PURIFICATION OF GAS.—Francois Jas, Paris, France. An apparatus for the purification of gas, consisting of a cylindrical vessel closed at either end and provided with a transverse partition dividing the same into two compartments, a shaft in one of said compartments, hollow at one end and journaled in the partition and in one end of the vessel, and a plurality of pipes wound spirally around said shaft and rotatable with the same having their open ends diametrically the farthest distance from the shaft and their other ends terminating in the hollow end of the shaft for discharging their contents into the other compartment.

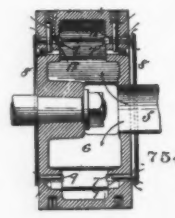
754,803. ORGANIC PHOSPHORUS COMPOUND AND PROCESS OF MAKING SAME.—Swigel Posternak, Mendon, France. A process for obtaining the assimilable phosphorus compound contained in most vegetable foodstuffs and especially in oil-cake, consisting in suitably comminuting the vegetable material, treating the comminuted vegetable material with an alkali lye in order to loosen the aleurone bodies, treating further the mass with a dilute mineral acid, filtering and mixing the filtered liquid with a heavy metal salt, a salt of an alkaline earth, an alkaline salt of an organic acid, and an alkaline substance, in order to precipitate the phosphorus compound in presence of a free organic acid in the form of double salts of alkaline earths and heavy metals, treating a suspension of the said double salts in water with hydrogen sulphide and filtering for removing the heavy metal as sulphide, and finally evaporating the filtered liquid.

754,824. PROCESS OF MAKING SULPHATE OF ALUMINUM.—Howard Spence, Manchester, England. A process for the manufacture of crystallized sulphate of alumina containing two molecules of SO_3 for each molecule of Al_2O_3 which consists in subjecting alumina in excess to the action of hot sulphuric acid under pressure so as to obtain a solution of sulphate of alumina containing an excess of alumina, treating this solution with available lime suspended in water until the desired basicity is obtained, filtering the resulting mixture, evaporating the filtered solution and separating the crystallized basic sulphate therefrom.

754,830. MACHINE FOR PREPARING BLASTING CHARGES.—Firmin J. Trayssac, Angels Camp, Cal. In a machine of the character described, a base having a cavity to receive a fuse for compression, a plate covering the cavity and having an opening communicating with said cavity, and a compressing device operating through the opening in the plate to compress the fuse in the cavity.

754,899. DISCHARGING DEVICE FOR DUMP-CARS.—John W. Seaver and George H. Hulett, Cleveland, Ohio, assignors to the Wellman-Seaver-Morgan Company, Cleveland, Ohio. The combination of a dump-car divided into a series of bins each having a discharging device independent of the others, and a lorry having driving mechanism constructed to engage either of said discharging devices by a movement either of the car or lorry.

754,901. COMPRESSOR FOR AIR OR OTHER GASEOUS BODIES.—Henry C. Sergeant, Westfield, N. J., assignor to The Ingersoll-Sergeant Drill Company, New York. The combination with the piston of a compressor constructed with an annular passage and with two valve-seats one within the

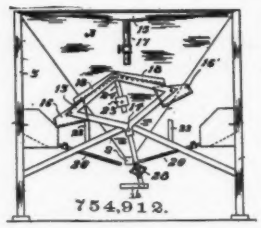

754,901.

inner circumference of said passage and the other outside of the outer circumference of said passage, of a ring-valve having internal and external flanges which form valve-faces corresponding respectively with said seats and having an annular stem which enters said passage and between the inside and outside of which and the inner and outer walls of the said passage there are spaces constituting two ports to the valve.

754,910. INGOT-CRANE.—Clarence L. Taylor, Alliance, Ohio, assignor to the Morgan Engineering Company, Alliance, Ohio. In an overhead traveling crane, the combination with a main drum and means for rotating same, of an auxiliary drum geared to the main drum so as to be actuated thereby and means for changing the position of the auxiliary drum with relation to the main drum.

754,911. AUTOMATIC ORE AND SLIME SEPARATOR.—Charles Allen, El Paso, Tex. The combination with an intermittently-oscillating tank or hopper hinged at one end and counterbalanced connections with the opposite end said tank or hopper having an inclined bottom and a discharge-passage in said bottom, of a valve in said passage connected with the counterbalanced connections and operable in unison with the oscillations of the tank.

754,912. AUTOMATIC ORE AND PULP SAMPLER.—Charles Allen, El Paso, Tex. The combination in a device of the character described, of a tilting tank or hopper having a sand-outlet in its


754,912.

bottom and a separate water-outlet, a valve in said first-named outlet controlled automatically by the tiltings of said hopper, a spout movable across the path of said sand-outlet and operable intermittently by the action of the discharged water from the tank.

754,927. MACHINE FOR MIXING CONCRETE, ETC.—John E. Kinsell, Detroit, Mich., assignor of one-half to Clarence C. Lowry, Detroit, Mich. In a mixing-machine, the combination of a supporting-frame consisting of parallel I-beams secured together by tie-bolts provided with nuts engaging the inner and outer sides of the webs of said beams, brackets secured to the upper side of said beams at each end of the frame, bearings on said brackets, a U-shaped trough having a closed and an open end and supported by the tie-rods, braces secured at one end to said beams and at their opposite ends to the sides of the trough near its upper edge, a shaft in said bearings extending in the axis of the trough, agitators on said shaft consisting of blades extending at an angle to the path of their travel around the shaft to feed the material toward the open end of the trough, and means for actuating said shaft.

754,946. SHOVELING DEVICE.—James G. Westbrook, Ogdensburg, N. Y. A mechanism for moving materials from place to place comprising a power-drum, a material-engaging shovel or scraper, a cable connecting the same with the said drum, an overhaul-cable connected with the scraper-cable for pulling it from its drum and an overhaul-spool for operating the same.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending February 27, 1904.

1,755 of 1903. SULPHURIC ANHYDRIDE MAKING.—W. Garroway, Glasgow. Making sulphuric anhydride by passing sulphureous acid gas, ozonized air, and oxides of nitrogen up a tower.

3,475 of 1903. OPEN-HEARTH STEEL FURNACE.—G. Quambusch, Dortmund, Germany. In open-hearth furnaces, making the hearths mounted on wheels and enclosed in a chamber, and packing the hearths with sand so as to prevent the heat getting to the iron work below.

6,222 of 1903. DRILL-HOLDER.—C. Summons, Cardiff. A drill-holder for holding drill steels to their work and turning them automatically between each blow.

18,589 of 1903. OIL CONCENTRATION.—A. E. Cattermole, London. A method of oil concentration, using a small amount of saponified oil and separating the mineral from the gangue by jigging.

24,639 of 1903. TREATING NITER CAKE.—C. L. Parker, London. A process for producing glaubers salts of high purity, ferrous carbonate, ferrous hydrate and ammonia from niter cake.

27,425 of 1903. TIN-PLATE CLEANER.—A. J. Maskrey, Martins Ferry, Ohio, U. S. A. Apparatus for straining off superfluous coating of tin from tin and terne plates.

28,134 of 1903. DIAMOND DRILL.—A. Macnamara, Randfontein, Transvaal. In diamond boring apparatus, methods of supporting and distributing the weights of the boring rods.

28,154 of 1903. MINE CAR.—H. Bushler, Zurich, Switzerland. Improvements in the inventor's system of cars for removing the debris of blasting operations in driving tunnels.

28,399 of 1903. MAGNETIC SEPARATOR.—F. T. Snyder, Oak Park, Illinois, U. S. A. Improvements in magnetic separators for acting on materials of low permeability.

SPECIAL CORRESPONDENCE.

Denver. Mar. 18.

(From Our Special Correspondent.)

On March 12 all union men employed on leases since the strike, were called out by the Cripple Creek executive committee of the Western Federation of Miners. The Midget mine on Gold Hill, controlled by James F. Burns and F. G. Peck, of the Portland Co., where 80 men are employed, was not excepted. The miners on the Trilby came to the surface, listened to the reading of the strike order, refused to obey, and returned to their work underground. It is stated on good authority that James F. Burns has been for some time in a controversy with the Federation over a demand by the organization, to reinstate certain union workmen discharged for cause, and this action in respect to leases has further provoked Mr. Burns. It is said also that the Federation some little time ago ordered the collection of delinquent dues from a number of union employes in the Portland mine through the pay-rolls of that company. In losing the co-operation of James F. Burns the Federation loses the aid of the only mine operator in Cripple Creek that it could be said to control.

The calling out of miners working on independent leases in the Cripple Creek district will affect some of the smaller mills which the district supplies, some of which depend on these leases for their main supply of ore.

It is now reported that all the union miners employed on the Portland mine have repudiated the Federation.

San Francisco. Mar. 16.

(From Our Special Correspondent.)

There seems to be renewed interest in magnesite mining, and a number of claims have lately been located in the eastern part of Alameda county. In the corner of Stanislaus, Alameda and Santa Clara counties a large deposit is being opened. Until within two years most of the California magnesite came from Chiles Valley, Napa county, but of late most of it comes from near Porterville, Tulare county. Did the demand warrant, double or treble the quantity might be mined each year. Magnesite is sold to paper manufacturers and also to the makers of carbonic acid gas.

More drift mines are being opened in the Blue Ravine region, above Folsom, Sacramento county. Bedrock lies at about 70 ft., and there is no great amount of water to handle. The ground is too deep to hydraulic or to dredge, and must be drifted. The Sutter Co. is to spend a considerable sum on a shaft, having located the channel by drilling.

While Shasta continues to be the greatest producing county of the State, Plumas county has an undeveloped copper section some 40 miles long and several miles wide. In the Genesee valley, at Taylorsville, several claims are being opened, and a smelter is expected to be put in the coming summer. In a short time a railroad connecting with San Francisco bay will run through this county, and then capital will go in. At present the miners are mainly holding on and waiting.

A preliminary agreement is reported signed between the Pacific Steel Co., of San Diego, and Milliken Bros., of New York, whereby under certain conditions the latter firm agrees to construct a large steel plant in San Diego, to include furnaces, buildings, railroad depots, wharves, bunkers, etc. The steel company has an option on 29 iron mines in lower California. The ore is said to be of excellent quality. But the iron ore from Mexico must pay a duty of 40c. per ton, and coal must also be shipped in either from Oregon, the Puget Sound ports, or from foreign sources, as there is no suitable coal in California, and if foreign must pay duty.

The Plumas Gold Mining Co. owning properties in Plumas county, McGill & Standart, and Douglas Lacey & Co., have been sued by local creditors. About $85,000 were spent for machinery, while the mine was under bond, but it was suddenly surrendered to the original owners, McGill & Standart, in default of $6,000, and the creditors and certain stockholders want to know why this was done. The mill started work on January 26, but Douglas Lacey & Co., issued a report stating that after 1,500 tons of ore had been treated the saving was less than $1 per ton. The mine has a different story.

When the affairs of the Red Cloud Mining Co., of southern California became entangled in insolvency, the stockholders found it necessary to levy an assessment on the stock of S. P. Creasinger, an officer of the company, who went into insolvency, applied for an injunction against selling his stock for the assessment, because the certificates of stock as issued stated they were fully paid up and non-assessable. The court decided that no valid contract against assessments had been shown, and therefore the stock will be sold for assessments. It will be seen from this that "fully paid up and non-assessable" stocks are not always what they seem. Unless the by-laws provide for this it does not seem to matter what is printed on the face of the stock.

The report that the famous old Eureka mine in Amador county had been bought since Alvinza Hayward's death, by the Oneida Mining Co., proves untrue. Mrs. Hetty Green, of New York, the owner, still holds out for $300,000 cash.

A company has been organized at Oroville to work black sands and base ores in that vicinity by a secret process. It happens there are no base ores near that place, and the process is to obtain more than fire assay value out of the sand. Further comment is unnecessary.

Spokane. March 15.

(From Our Special Correspondent.)

The Red Boy Consolidated Mining Co., owning the Red Boy and the Concord groups in eastern Oregon, is trying to arrange for a settlement of its financial difficulties so that the properties will be taken over by friendly hands when sold by the sheriff on May 10, at Baker City, Ore. E. J. Godfrey is president of the company.

Heavy snows that are 15 ft. deep in places, are interfering with the development of the mines in eastern Oregon this winter. The E. & E. is having plans drawn for a 100-ton cyanide plant to treat the tailings from its present mill. All work at the Columbia is confined to the 700-ft. level. The Alamo, in the Greenhorn district, is planning the erection of a cyanide plant, but details are not completed.

The Insurgent and the Lone Pine Consolidated companies have reached an amicable agreement in the suit brought by the Insurgent for ore taken by the Lone Pine through the latter's workings at Republic. Arthur A. Booth reported that only 118 tons of Insurgent ore were taken, valued at $17 a ton, and the Lone Pine will pay $1,000 to the Insurgent.

The Tom Thumb Mining Co., owning the Tom Thumb at Republic, has reorganized as an assessable company, known as the Midget Consolidated, and has called the first assessment of .8c. a share to pay outstanding debts. It expects to resume work and install a cyanide mill.

The Old National Bank, of Spokane, is making arrangements with Rossland, B. C., people to lease the O. K. mill there, owned by the bank, to the interests that control the I X L mine. Work is to start on the I X L, and it should begin milling April 1.

Scandal is brewing in the Waterloo Consolidated over a specific promise of dividends. Instead of dividends an assessment of .1c. a share has been called. The stock rose from 5c. to 10c. a share three months ago, but has fallen to 1.5c. The property is at Camp McKinney, B. C., but the head offices are at Spokane.

Negotiations in the Coeur d'Alenes for the erection of a $100,000 copper leaching plant to handle the ores from the Snowshoe mine, near Mullan, are off. It is announced that the Waterbury interests refused to allow the Snowshoe to inspect its books.

The Kentucky-Vermillion Co., which lost by fire its large mill in Montana, is suing four insurance companies for $5,000 each on account of policies. The case is in the Federal court here.

Opals of good quality are reported found near Moscow, Idaho, in a matrix which can only be removed with difficulty. The opals break easily, but the colors are good.

Toronto. Mar. 17.

(From Our Special Correspondent.)

As a result of the strong representations made to the Dominion government on behalf of the Kootenay, B. C., mining industry, an order in council has been passed placing petroleum oil on the free list when imported by mining companies for use in the concentration of metal ores.

A meeting of the directors of the Nova Scotia Steel & Coal Co., Ltd., was held in Montreal, on March 12. The report of the general manager showed the business of the company during the year to have been the largest in its history. The regular quarterly dividend of 2% was declared on preference stock and a half yearly dividend of 3% on common stock. The profits for 1903 were $859,397 as compared with $609,935 for the previous year. The sum of $685,642 was carried forward to the credit of the profit and loss account.

J. H. Plummer, president of the Dominion Iron & Steel Co., at a meeting in Montreal on March 14 submitted a report of the company's operations. At present two blast and two open-hearth furnaces are in operation. The coal washing plant now being constructed will have a capacity of 200 tons per hour. All the coke will be produced from washed coal. The company now employs about 2,000 men and expects that the number will be largely increased. When the plant is completed it will have a capacity of from 200,000 to 250,000 tons of steel per year.

In order to conserve the water supply in the Yukon the Dominion Government has approved a plan to impound the surplus water which has hitherto been allowed to escape in the spring and the rainy season, by the creation of reservoirs in the creeks and gulches and the storage of water on worked-over or wornout ground. To accomplish this lands required for reservoir sites have been withdrawn from mining entry, such land being selected as has been found worthless for placer mining.

The Tip Top copper mine, 80 miles from Port Arthur, Ont., has been closed down and the project for erecting a smelter in connection with it at Port Arthur abandoned. The reason assigned is the excessive rate demanded by the Canadian Northern Railway for hauling the ore to Port Arthur.

The Eastern Township Mining & Smelting Co. is promoting a project for the establishment of a copper smelter at Sherbrooke, Que. It largely depends, however, on the granting of a bonus of $10,000 with 10 years' exemption from taxes by the city. If this is secured the company agree to put up a $25,000 smelter within 15 months.

San Luis Potosi. Mar. 15.

(From Our Special Correspondent.)

Perhaps the most important work in Zacatecas is that on the San Rafael-Grande, of the A. E. Stillwell interests. The mine will be unwatered, the shaft sunk, and mining started. Northwest of the town of Zacatecas, and just north of El Bote, a rich copper belt is being opened up by Caster McKay and others. The Perro Blanco, the leading property, is said to have 10 ft. of a first grade ore, which in places runs as high as 30% copper, though low in silver. El Gato Negro and the Jesus Maria are on the same vein. The Guggenheims are said to have taken a working option on the Mala Noche and Veta Grande. In Chalchihuites a controlling interest in El Prodigo has been sold by C. D. Mansfield, of Zacatecas, to A. J. Smith, of Los Angeles, who is preparing to put in a concentrating mill.

In the northwestern part of the State of Mexico, near Zacualpam, in the district of Ixtapam, C. J. Kleeman and R. J. Kerr have purchased some 30 pertinencias; have opened a vein about one meter thick, assaying reported to carry $15 in gold, and are erecting mine buildings, mill and electric power plant on the river.

It is understood that the Standard Oil Co., known in Mexico as the Waters-Pierce Oil Co., is, through H. Clay Pierce, of St. Louis, negotiating with the Mexican Petroleum Co. for the Ebano fields, in the State of San Luis Potosi, where are 13 wells, a refinery, water works, etc. Near Vera Cruz are the properties

of the Oil Fields of Mexico Co., with headquarters at 31 Nassau street, New York, for which E. C. Moxham, the president, has ordered $50,000 worth of machinery from the Oil Well Supply Co., of Pittsburg. In Campeche, an American company has taken an option on the Hidalgo Hacienda, and contracted to expend $50,000 Mexican in prospecting for oil. In Tabasco, near Macuspaud de Tabasco, the Tabasco Oil Co., in charge of O. H. Barker, in their first hole of 800 ft. has struck three oil horizons, at 160, 260 and 482 ft. New machinery has been ordered. Surveys have been made to Macuspaud river, for a pipe line, a distance of six miles, whence barges may take the oil to tide water.

Medellin. Feb. 17.

(From Our Special Correspondent.)

The Republic of Colombia is just now very much in the public eye, largely because of the secession of the State of Panama and the steps taken by the United States to protect the latter. Few know of the great natural resources of the interior, which is reached only after many hundred miles of travel up the Magdalena river. To judge of the climate, agricultural and mineral wealth of the region by a visit to Cartagena or Panama would be like judging the agricultural possibilities of Iowa and the mineral wealth of Colorado by a trip to the low sandy shores of Florida. The mineral possibilities are very great, and the facilities for economical mining much superior in many ways to those in the United States. The climate is cool—cool enough for work—and at night one or more blankets are needed, but no expense for fuel. The surface is usually covered with deep, fertile soil, capable of producing everything needed to eat, including corn, rice, sugar, coffee, fruits, vegetables, and grass for stock. The land can be cultivated to the mountain tops. Magnificent timber and water is found everywhere, supplies of all kinds and labor are abundant and cheap. There are no labor-unions, no snow or ice. Almost every variety of mineral and precious stones are found within Colombia's borders. Agates, jasper, garnets, jets, cornelians and diamonds are found, while the emerald deposits are the best and practically the only ones in the world. Variegated marbles, building stone, lime, salt, copper, lead, zinc, mercury, iron, coal, asphaltum, oil, platinum, silver and gold are mined in many places. It is estimated that since the Spaniards first entered Colombia there has been exported more than $700,000,000 of gold. Of this sum nearly one-half has been furnished by the State of Antioquia, of which Medellin is the capital.

At the present time foreign capital is coming in, and in almost every district you hear of new development work and improvements. Milling plants are usually crude and small. Among the largest enterprises operated by Colombians are the Zancudo mines, near Titiribe. They have produced upward of $10,000,000. Near the above group is the Otromina, operating 18 California stamps on ore averaging $20 per ton. Twelve additional stamps are being added. It is to be noted that every part of the equipment is manufactured here; the crude iron is mined, coke converted from coal, and all machinery, including a Pelton wheel, made near the mine. Juan de la Posado is president of the company. The Frontino & Bolivia Mining Co., of London, near Remedios, is adding a $75,000 electric plant capable of furnishing 500-h.p. This company has the deepest workings of any mine in Colombia, 440 ft. vertical depth. Another English concern has been operating, on a small scale, the El Cerro mines near Frontino; it is the intention to install an extensive plant, and with that in view, Mr. Geo. E. Tilly, recently engineer at the Huanchaca mines in Bolivia, is now inspecting the property. Near Souson a group of mines, the San Andres, has been bonded by C. L. Wright, of New York, for $125,000, who has interested London capital. An engineer is now on his way to examine the property. Some excitement has been caused here by the discovery of a very rich lode near Andes, in this State. It is in a wild country and at present reached by three days' travel on mule-back followed by three days on foot. A reliable man who visited the property and sampled it reports a 2-ft. vein averaging $150 per ton and a 20-ft. vein all mineralized with two streaks each, 2 ft. wide, averaging over $100 per ton.

London. Mar. 12.

(From Our Special Correspondent.)

It will be remembered that the difficulty in persuading the public prosecutor to undertake the prosecution of the late Whitaker Wright was the incomplete state of the law with regard to the issue of false balance sheets. The law distinctly says that such issue must be proved to be "with intent to defraud," so that the act itself is not a punishable offence. To remedy this uncertainty in connection with the application of the law, it is now proposed to make an amendment which will leave no loophole for the escape of the culprit. The new clause will enact that if any person, officer of a company or not, circulates a statement in writing or print in connection with the financial position of the company, which he knows to be false in any material particular, he shall be guilty of a misdemeanor and be liable to imprisonment for two years, or a fine of £500. In order to escape indictment under this head, the issue of such statements will have to show that he was not aware of their falsity. No doubt the fraudulent promoter will shape his actions in such a way as to enable him to set up such a defence. But, at any rate, the new clause will put a new difficulty in his path, so it is to be hoped that it will become law forthwith.

The progress of one of the reconstructed Whitaker Wright companies, the Standard Exploration Co., has been followed in London with considerable interest, although it was generally feared that little good would be done. This company was originally formed six years ago to take over from the London & Globe a number of West Australian failures, together with a nonexistent placer in Alaska. After the collapse three years since, certain city men thought it worth while to buy the West Australian properties from the official receiver, and to reconstruct the company as the New Standard Exploration Co. This was effected in the summer of 1902, and a considerable amount of new capital was provided. The mining engineers went very carefully over the ground, and decided that Raddington Consols was the most promising of the properties. Their attention was, therefore, concentrated on the development of this mine, while several of the other were either sold off for trifling sums, or let to tributors. After doing considerable development at Raddington Consols, it was found that the contents of the ore treated were low. The stamps recovered only 3,328 oz. of bullion, worth £3 11s. 9d. per ounce, from 16,415 tons. The cyaniding of 12,880 tons of sands yielded 2,075 oz. of gold, and the filter presses treated 19,375 tons of slimes recovering 2,359 oz., the bullion from these two sources being of slightly less value than that from the stamps. In sinking the shaft deeper the ore-bodies were found to be patchy, and of lower grade, but there are indications that give the engineers hope that higher grade ores will be met with lower down. At the present time the company has come to the end of its capital, so that debentures for £15,000 are to be issued to provide funds for continuing sinking. The shaft is now down 700 ft., and it is intended to go down 300 ft. more. The mining market is badly in want of a tonic. I can think of nothing that would act so efficiently in this direction than the striking of a rich zone at this mine.

It is pleasant to be able to record that the firm of lead smelters and lead manufacturers, Walkers, Parker & Co., Ltd., of London and Chester, has at last attained a sound financial condition. American visitors to London will remember the shot tower belonging to the firm that forms a conspicuous feature of the landscape on the Surrey side of the river opposite the Hotel Cecil. The firm is a well known manufacturer of sheet lead, lead pipe and shot, and also of white lead and red lead. They produce some of their pig lead, but buy more in the open market, as pig or as base bullion. The altered conditions of smelting and refining in England, and the depression in the price of lead, seriously affected the position of the company, and for 13 years neither ordinary nor preference shareholders received a dividend. Not only so, but the shortness of capital crippled their operations when in the market for pig lead. It must be confessed that the directors and managers were not equal to the emergency, and for some years the business of the company dragged along painfully. A few years ago, however, the needful alterations were made in the management and control, so that the directors are now in the proud position of being able to resume dividends on the preference stock. Their first distribution, made this week, has been wisely restricted in amount, so as to give the company plenty of reserve cash for purchasing pig lead; and in the future these reserves will be gradually augmented. It is confidently hoped that the company will continue to advance, now that it has once turned the corner.

The Frontino & Bolivia (South American) Gold Mining Co. is about to issue £35,000 new capital in preference shares, in order to provide new electrical power plant and to continue general developments. This company has been in existence for 40 years, working the Silencio group of mines in Colombia, and has had varying fortunes, due partly to engineering difficulties and partly to political revolutions. From the year 1888 up to the middle of 1901 dividends were paid regularly. It is expected that with the new capital, and with satisfactory political conditions, the company will once more attain prosperity.

Perth. Feb. 15.

(From Our Special Correspondent.)

The January gold yield shows a great improvement. It was 211,373 oz. gross, or 176,653 oz. fine, valued at £750,375. The Commonwealth and State governments are considering concerted action to attract population, especially small farmers. It is also probable that liberal concessions will be made in mining laws to attract capital.

The Burtville district is opening well. Many leases making good yields. At Erlistoun a large number of men are steadily developing their claims, with very fair prospects.

Alluvial gold is reported from the northwest, at Whim creek, where some good gold has been obtained.

Kalgoorlie.—The Oroya-Brownhill's yield for January was a record one, 12,907 oz. fine, valued at £54,725. The company's output has for some time been averaging about 1.5 oz. per ton of ore treated. In the Associated, the continuance of the rich Brownhill shoot has been practically proved into the company's ground. In the Ivanhoe Junction, good ore, worth 2 oz. per ton is being stoped. The Golden Horseshoe treated in January 16,630 tons for a return of 15,752 oz. fine gold, valued at £64,639. The Great Boulder Proprietary's January yield was 11,477 oz. fine gold.

Laverton.—A rich and important strike is reported in the Craigiemore, at the 230 ft. level, where a lode 45 ft. wide has been crosscut, assaying from 11 to 21 dwt. per ton.

Norseman.—Good returns are made; the Valkyrie continues to get very rich stone.

Phillips River.—A special report has been issued by the Mines Department on this gold and copper field. The Minister is now visiting the district to decide on erecting smelters. The leases are opening up well. About 3,000 tons of ore have accumulated, purchased by the department to assist prospectors.

Sydney. Feb. 16.

(From Our Special Correspondent.)

The Mt. Lyell Co.'s smelting returns for January show 30,955 tons treated for 595 tons blister containing 587 tons copper, 64,762 oz. silver and 1,520 oz. gold. At the North Lyell mine there has been a large slip in the main stope, 4,000 tons having come down.

The Murchison mine, Mt. Farrell, is shipping about 50 tons per week. The stope in No. 1 level is on decomposed ore assaying 200 oz. silver per ton.

The Queen's Cross gold mine has treated 1,097 tons for 3,948 oz. smelted gold, and is paying a dividend of 2s. per share, or £20,000.

The Croydon gold returns in 1903 were 70,905 oz. from 6,195 tons of ore.

There is a marked increase over the produc-

tion of 1902, especialy in the case of the value of minerals other than gold, coal and gems. Some of the principal mine returns for January are: S. Glanmire & Monklands, 2,250 tons for 2,043 oz.; Queen Cross Reef, 1,097 tons for 39,480 oz.; Brilliant & Central, 2,140 tons for 1,812 oz.; No. 4, N. Phoenix, 650 tons for 1,022 oz.; No. 2, S. Great Eastern, 4,050 tons for 4,656 oz..

The Mt. Morgan mine treated 19,370 tons of ore and 6,704 of tailings, and cleaned up for 10,824 oz. of gold. Dividend for January, £12,000.

The semi-yearly report of the No. 2 S. Great Eastern mine, Gympie, shows 22,027 tons treated for 2,660 oz. gold—crushing cost 4s. 7d. per ton. Twenty extra heads of stamps will be erected.

The tin output from Stannary Hills, Watsonville, Irvinebank and district was 161 tons, worth £11,257, and 25 tons of stream tin worth £1,785. The total output of stream tin for 1903 was 610¼ tons, worth £45,287. The ore crushed for the last year was 51,537¼ tons for 2,264¼ tons tin stone worth £135,465.

Owing to the continued refusal of the miners to abide by the decision of the Arbitration Court the Teralbo coal mine has practically ceased work. Machine coal cutters will soon be installed. The Pelaw Main and South Greta mines are also introducing coal cutters.

About 41 dredging plants are at work. The number of persons employed in mining was 37,739, an increase of 4,044.

The Sulphide Corporation for the two weeks, at the Central mine treated 6,925 tons for 1,686 tons concentrates, containing about 30.13 oz. silver per ton, 61% lead and 10.4% zinc. At Cockle creek 720 tons of bullion were produced, containing 1,529 oz. gold and 42,464 oz. silver.

The Crowl creek copper mines extracted 54 tons of metal during January.

Gold returns for 1903 were as follows: New South Wales, 254,260 oz., valued at £1,080,029; Victoria, 767,351 oz., valued at £3,259,482; Queensland, 659,042 oz., valued at £2,799,579.

Broken Hill.—Broken Hill South mine has treated (latest returns) 3,366 tons crude and 680 tons tailings, producing 529 concentrates, containing 67% lead, 7% zinc and 29 oz. silver per ton. The output of the Proprietary refinery for January was: Silver, 362,019 oz.; lead, 4,864 tons; antimonial lead, 34 tons.

New South Wales.—The returns of the mineral industry for 1903 show a total production valued at £6,059,486, an increase of £421,341. This includes gold, 254,260 oz., valued at £1,080,029, and silver, £1,501,403.

Auckland. Feb. 26.

(From Our Special Correspondent.)

The New Zealand Crown Co. with a return of £4,201 ($21,005) from 2,810 tons, shows a rather serious falling off from previous yields, last year's monthly average being over £6,000. The only other returns over £1,000 to hand during the past month are those of the Komata Reefs Co. £2,425, or $12,125 from 1,300 tons, and Tairua Broken Hills £1,575, or $7,875 from 300 tons.

Reefton Goldfield.—The January returns from the Consolidated Goldfields Co.'s mines are as follows: Progress mines, 4,430 tons crushed in the 65-stamp mill, producing 1,606 oz. of bullion, valued at £6,689; 90 tons of concentrates chlorinated for a return of £1,005, 2,328 tons of tailings cyanided, yielding bullion valued at £715; total return £8,409 ($42,045). Wealth of Nations, 1,095 tons of ore crushed in the 20-stamp mill, yielding 298 oz. of bullion, valued at £1,226; six tons of concentrates produced, and 710 tons of coarse sands cyanided for a return of £463; total, £1,689 ($8,445). Golden Fleece, 1,080 tons of ore crushed in the 20-stamp mill for a return of 329 oz. of bullion, valued at £1,325; 17 tons of concentrates were produced, and 700 tons of coarse sands cyanided for a yield of £187; total, £1,512 ($7,560).

State Coal Mines.—The State coal mines at Greymouth and at Seddonville, near Westport, are now tolerably well advanced as regards development. The present output is about 1,000 tons per week, and before long will be largely increased. It is stated that both mines contain large quantities of first-class coal.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL, and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mining and metallurgical engineers are invited to keep the Engineering and Mining Journal informed of their movements and appointments.

Mr. Charles Butters is now at San Francisco.

Mr. Frank Sizer, of Helena, Mont., is visiting New York.

Mr. E. H. Garthwaite is expected in London from Bulawayo.

Mr. Rasmus Hanson, of Eureka, Colo., is visiting New York.

Mr. J. Boyd Aarons is manager of the Imani gold mine in Rhodesia.

Mr. W. Spencer Hutchinson, of Boston, is at Albuquerque, New Mexico.

Mr. W. B. Devereux is examining mines near Culiacan, in Sinaloa, Mexico.

Mr. Ellsworth Daggett, of Salt Lake City, Utah, went to Nevada on March 21.

Dr. Edgar Samson, a metallurgical chemist from Brussels, is visiting New York.

Mr. E. Henry Davies has left London to attend to professional work in Hungary.

Mr. John B. Farish has left New York for Chicago and, probably, San Francisco.

Mr. Frank B. Cook has returned to Salt Lake City from Tonopah and Goldfield, Nevada.

Mr. T. R. Countryman is engaged in professional work at Encampment, in Wyoming.

Mr. T. Davidov, of New York, has gone on professional work to Barranquilla, Colombia.

Mr. William A. Farish, of Salt Lake City, on his return from Mexico, went to Boston.

Mr. H. Knutsen, who has been to Colorado, sailed for England by the *Blücher* on March 24.

Mr. H. D. Allen, of Seattle, Wash., has been examining mines in Nevada county, California.

Mr. Geo. F. Beardsley, of San Francisco, has been examining mines in northern California.

Mr. Richard M. Atwater has changed headquarters from Nelson, B. C., to Helena, Montana.

Mr. J. A. Chalmers, who has been to Borneo and Australia lately, has left London for Johannesburg.

Mr. F. C. Roberts left New York on March 17 by the *Havana* for Vera Cruz, en route to Mexico City.

Mr. J. H. Baker is now assayer and surveyor at the Antenior mine in the Gwanda district of Rhodesia.

Mr. G. E. Alexander, of Denver, is now metallurgist to the Crown King mine, near Prescott, Arizona.

Mr. E. C. Engelhardt has returned to Denver, Colo., from a professional trip of five months in Arizona.

Mr. J. A. McCaskell, of New York, is now assistant superintendent of the Daly-West mine, at Park City, Utah.

Mr. Reginald Robinson is assistant manager of one of the Coronation Syndicate's mines at Heidelberg, Transvaal.

Mr. J. M. Boutwell, of the United States Geological Survey, has returned to Washington from Park City, Utah.

Mr. Arthur Winslow, of Boston, has been at Goldfield, Nev., where he is general manager of the Combination mine.

Mr. F. E. Shepard, president of the Denver Engineering Works Co., Denver, Colo., was recently at Salt Lake City.

Mr. H. D. Conant has been appointed superintendent of the Lake Superior Smelting Co., near Houghton, Michigan.

Mr. A. B. Cousin, manager of the Galice Consolidated Mines, has returned to Portland, Ore., from New York City.

Mr. Cord Meyer, of New York, a director of the Tennessee Coal, Iron and Railroad Co., has been at Birmingham, Alabama.

Mr. John Herron, manager of the Tomboy Mining Co., has returned to Telluride, Colo., after two months' holiday in California.

Mr. Jay P. Graves, general manager of the Granby Consolidated Co., has been in Montreal to confer with the directors of the company.

Mr. J. J. May has been appointed manager of the mill of the Idaho Springs Mining & Reduction Co., near Idaho Springs, Colorado.

Mr. Hermann C. Bellinger, of the Northwestern Smelting & Refining Co., operating at Crofton, B. C., has been in Spokane, Wash.

Mr. F. M. Simonds, of the firm of Simonds & Wainwright, of New York, in company with Mr. Harold Sherman, has returned from the West.

Mr. Louis Chevrillon, who has just been to Morocco, returned from Europe by the *Kronprinz Wilhelm*, and is now on his way to Denver.

Mr. George J. Bancroft will take charge of the department of mine management of the Engineering Co. of America, with headquarters at Denver.

Mr. James M. Meighan, formerly superintendent of the Mount Jefferson Mines, Consolidated, of Tuolumne, Cal., now has offices in the Crocker building, San Francisco.

Mr. J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., has returned to Birmingham, Ala., after attending the meetings of the company in New York and Jersey City.

Mr. Frank K. Borrow, formerly at Telluride, Colo., is now assistant manager to the Matabele Gold Reefs Co., in Rhodesia, with headquarters at the Geelong mine in the Gwanda district.

Messrs. H. O. Seixas, W. H. Goadby and George Parsons, of New York, directors in the Sloss-Sheffield Steel & Iron Co., are in Alabama looking over the properties of the company.

Mr. Philetus W. Gates and Mr. Henry W. Hoyt, respectively general superintendent and second vice-president of the Allis-Chalmers Co., Milwaukee, Wis., are about to retire from the active management of that company.

Mr. B. H. Warren, formerly second vice-president of the Westinghouse Electric & Manufacturing Co., has been elected president of the Allis-Chalmers Co., effective April 1, to succeed Mr. Charles Allis, who recently resigned.

OBITUARY.

Abner W. Colgate, who was for 40 years an active member of Atlantic White Lead Co., died suddenly at Moonstown, N. J., on March 21. He was 65 years old.

M. M. Miller, of Salt Lake City, Utah, died on March 14. He moved to Salt Lake from Texas eight years ago and was formerly actively engaged in mining at Silver City, New Mexico.

Alexander G. Pendleton, a mining and civil engineer, died at Globe, Ariz., on March 12. He was a graduate of the Rensselaer Polytechnic Institute, and was one of the pioneers in the mining camps of Arizona. For several years he was in the employ of the Old Dominion Copper Company.

William R. Grace, president of the Ingersoll-Sergeant Rock Drill Co., senior member of the great shipping house of W. R. Grace & Co., and twice Mayor of New York, died in New

York March 21 from complications following an attack of pneumonia. Mr. Grace, who was born at Queenstown, Ireland, in 1832, came to New York in 1846 as a cabin boy and runaway. A year or two later he went to South America where, through his father's aid, a position was obtained for him in the office of Bryce & Co., of Callao, Peru. His abilities were soon seen, and in 1853 he was made a partner in the firm, which became Bryce, Grace & Co., and ultimately W. R. Grace & Co., of New York, with branches in London, Callao, San Francisco, Valparaiso, Para, Santiago and Concepcion. The firm was incorporated in 1895, with Mr. Grace as president. It controlled the New York and Pacific Steamship Co., having a fleet of five steamships plying between New York and South America. The firm handled the bulk of the nitrate of soda imported at New York and Baltimore, that is, the larger part of the tonnage shipped to the United States.

Mr. Grace was a director in many industrial and financial concerns, including the Export Lumber Co., the Lincoln National Bank, the Terminal Improvement Co., the New York Life Insurance Co. and the United States Casualty Co. In his political career Mr. Grace opposed corruption and stood for honesty and progress. He left a widow and five children.

SOCIETIES AND TECHNICAL SCHOOLS.

Colorado College.—The new science and administration building at Colorado Springs, Palmer Hall, recently dedicated, is 287 ft. long by 90 ft. wide, and has a basement and a first and second floor. It cost $280,000. The outer walls are of sandstone, the frame of steel, and the floors of concrete. An endowment of $50,000 has been provided for the building. Of the scientific staff of the college, Mr. W. Stueby is professor of chemistry and Dr. G. I. Finlay professor of geology, mineralogy and paleontology.

Civil Engineers' Society of St. Paul.—At the meeting on March 14, 12 members and one visitor were present. Mr. W. A. Truesdell informally presented some interesting facts and conjectures as to the origin of the United States system of land surveys. He has been unable to find, either at Washington or in the Ohio state records any official reports of the earlier heads of the Government Surveys and very little definite information as to their individual efforts. His researches have led him to decide that Washington, Harrison, Tiffin and Pease had little to do with the plan. Jefferson possibly may have been concerned in it. The germ of the scheme seems to have originated in 1764 with Thos. Hutchins, afterward the first official surveyor of the public lands. His successor, the first surveyor general, Rufus Putnam, apparently first suggested the 6-mile township of 36 lots laid out in ranges. The present system was established in 1785, and Hutchins surveyed the seven ranges in eastern Ohio the following year. Putnam, his successor, continued the Ohio survey in 1796, his township being groups of sections instead of lots and numbered in the order of to-day. The Military Bounty Lands were laid out in townships 5 miles square in 1796. Jefferson deposed Putnam after six years' service, for accepting careless work, and appointed Richard Mansfield, who introduced the correction lines and perfected the system in its minor details.

INDUSTRIAL.

The Jimulco Mining Co., operating extensive property in the State of Coahuila, Mexico, has been granted a concession to construct a railroad between the mines and the Jimulco Hacienda. The road will be narrow gauge and about six miles long.

The Babcock & Wilcox Co., of New York City, has secured a contract for boilers to be installed in the copper smelting plant about to be constructed by the Cerro de Pasco Mining Co., at Cerro de Pasco, Peru, in which J. B. Haggin is interested. The contract calls for 4,000 h. p. The American Bridge Co. will furnish structural steel for the buildings.

The Sullivan Machinery Co., Chicago, reports that owing to the growth of its business, it is making several changes in the addresses of its different offices to secure larger quarters. The New York office is now located at 42 Broadway. After April 1 the Pittsburg office will be at the Farmers' Bank building, and about April 15 the general offices in Chicago will move to the Railway Exchange building.

A contract for about $145,000 worth of boring mills has been awarded to the Niles-Bement-Pond Co. by the General Electric Co. There were 13 machines, all of very heavy design, running up to 14 ft. in size. It is stated the machines will be used in the company's new turbo-generator department at Schenectady. The Niles boring mills already form a large part of the equipment of this department, as some 20 machines similar to those just ordered have been installed.

The general office of the Federal Lead Co., which has heretofore been maintained at 705 Olive street, St. Louis, has been removed to the smelting plant near Alton, Ill. All invoices, mail matter, telegraph and express pertaining to smelter business should be addressed to Federal, Ill. The company has established an office at Flat River for the transaction of all business pertaining to the mines. All invoices, mail matter, telegraph and express pertaining to mine business should be addressed to Flat River, Mo. The general manager of the company is F. W. Scofield.

The Shoshone Falls Power & Lighting Co. has been organized with a capital stock of $2,500,000, with a bond issue of equal amount to build a power plant on the Snake river from which electricity will be transmitted to Salt Lake and intermediate cities. Three power plants in all will be erected, at Augur Falls, Twin Falls, and Shoshone Falls, with a total capacity of 80,000 to 100,000 h. p. The turbines and other machinery for the first plant are being ordered. Some of the men reported to be interested in the enterprise are Governor Aaron T. Bliss, of Michigan; E. E. Calvin, Archibald Milner and Frank Knox, of Salt Lake City, Utah; I. B. Perrin, of Blue Lakes, Ida., and Judge Samuel Hughes, of Boise.

The Mexico Mine & Smelter Co. has recently taken contracts, which represent an aggregate of about $200,000 gold. La Blanca Pachuca Co. has ordered a large Sullivan air compressor and a hoisting engine for its mines. A complete smelting outfit, which includes smelter, several ore cars, engines, boilers and rails, was ordered by the Reforma Mining & Smelting Co., of Guerrero. The Compania Industrial Atlixco has ordered a large lot of asbestos pipe covering. The Queretaro Tramways Co. has contracted for a quantity of rails and several passenger coaches and freight cars. The El Oro Mining & Railway Co. has ordered heavy steel sand pumping equipments, to be built by the Morris Machine Works of Baldwinville, N. Y.

A system of high-pressure water mains for the business district of Chicago has been reported upon by George W. Jackson, engineer for the Commission on High Pressure Water Systems. It is proposed to construct under the Chicago river, at a depth of 77 ft. (below the low-water level of Lake Michigan) for the lowest part of the work a main conduit 6 ft. 4 in. by 8 ft. 4 in. Within this conduit will be the main 36-in. pipe of the system, designed to stand a pressure of 1,800 lb. to the square inch. Branch pipes will lead to hydrants in every block within the district bounded by Lake Michigan, Halsted street, Chicago avenue and Twelfth street. The pressure at the pumps will be 300 lb. per sq. in. and at the hydrants 200 lb. per sq. in. The cost is estimated at $3,203,480. There will be about 9,000 ft. of 36-in. main pipe. Mr. Jackson recommends gas engines for the duty required of pumping 43,000,000 gal. of water per 24 hours. The cost of maintenance per year of pumping plant will be about $8,000 less for gas engines than for steam.

TRADE CATALOGUES.

The American Air Compressor Works, of New York City, is sending out a little vest pocket booklet, containing much information on compressed air installations, air compressors and air valves manufactured by the company.

A valuable booklet and price list is combined in catalogue No. 2, designed primarily for the prospector, which is issued by the Keystone Driller Co., of Beaver Falls, Pa., showing the company's prospecting machines, with instructions for exploring and assaying placer gold mines and testing for coal, lead, zinc, iron, etc.

The Vulcan Iron Works, of Toledo, O., has compiled and issued a combination vest pocket memorandum book, containing numerous extracts of data on various subjects. The prime object of the book, however, is to call attention to the company's dredges, several styles and sizes of which are shown, both steam and electrically operated.

A general catalogue of mining and milling, machinery and kindred supplies is a recent publication of the S. H. Supply Co., of Denver, Colo., wherein are listed numerous machines with data bearing on their sizes, capacities, etc. The list apparently covers machinery in the line mentioned from a Corliss engine to a carriage bolt, and is replete with illustrations of a small part of the machinery offered.

In the issuance and compilation of its new No. 8 machinery catalogue, the Hendrie & Bolthoff Manufacturing & Supply Co., of Denver, Colo., has been eminently successful in placing in the hands of the mining and milling trade a most complete list of the machinery used in that line. The volume comprises about 220 well filled pages, and covers hoisting engines, steam pumps, boilers, air compressors, stamp mills, concentrators, railway supplies, and other supplies too numerous to mention.

GENERAL MINING NEWS.

Bituminous Miners' Wage Scale.—The ultimatum of the operators of the "Central Competitive District" was accepted by the United Mine Workers, the union lodges in nine states voting on March 15. The total vote cast is announced as 107,453, and the majority against striking was 33,401. The vote for striking came largely from Illinois, the miners in that state casting 34,700 votes for and but 14,703 against striking. The scale is to last two years and the wages to be paid based on Hocking Valley scale with modifications for other districts are: Pick mining, 1.25 in. screened coal, 85c. (was 90c.); pick mining, run-of-mine 52c. (was 55c.); mining with punching machines, screened coal basis, 68c. (was 72c); run-of-mine, 42c. (was 45c.); chain machine mining, screened coal basis, 65.5c. (was 68.5c.) The inside wage scale is as follows: Track layers, $2.42; track layers' helpers, $2.23, and all other inside day labor, $2.23; bottom cagers, $2.42; drivers, $2.42; trip riders, $2.42; water haulers and machine haulers, $2.42; timbermen, $2.42; pipemen, for compressed air plants, $2.36.

ARIZONA.

MOHAVE COUNTY.

(*From Our Special Correspondent.*)

Empire Flat.—This group of mines, on Bill Williams' fork has a good force of men at work. Carbonates of copper predominate in ore values.

Great Britain.—This mine, in the Little Wallupai mountains, southeast of Kingman, has started work. The values are in gold, silver and copper, and both sinking and tunneling is being carried on.

Great West.—The machinery and building material for this mine in Minnesota district has arrived, and work will begin at once. Much gold ore is being blocked out. Five large cyanide tanks have just been completed.

Queen.—The Cedar Valley Mining Co. has opened up a rich vein of gold and silver ore on this mine at Cedar.

Roger Boy.—This mine, on the summit of the Cerbat range, northeast of Chloride, is installing a gasoline motor hoist over the 93-ft. shaft.

San Francisco.—The ledge on this mine in San Francisco district has been cut at 400 ft. The vein is said to be 20 in. wide.

Treasure Vault.—This gold mine, near Nigger Head, is having ore stoped for shipment. The workings are down 80 ft.

Virginia.—Lew Blakely has taken a short-term lease on this mine, in the Weaver district, and has two stamps crushing ore.

GILA COUNTY.

(*From Our Special Correspondent.*)

Old Dominion Copper Co.—This company is pushing work on its new plant with all possible speed. The 5-compartment shaft will be hoisting ore in a few days; it is now bottomed in the 10th level, but is being connected with the 12th by a winze. It is expected that the smelting plant, which will include three furnaces and two stands of converters will be in operation about June 1. With the completion of the improvements the company will be in position to turn out about twice as much copper as at present. California petroleum is to be used for generating power.

United Globe Co.—The new shaft on the Big Johnnie and O'Dougherty claims is down 125 ft.

GRAHAM COUNTY.

Arizona Copper Co.—This company's production of copper for February was equivalent to 1,241 tons of 2,000 lb. each.

PINAL COUNTY.

(*From Our Special Correspondent.*)

Lake Superior & Arizona Mining Co.—This company is actively developing its property 30 miles west of Globe. A 2-compartment shaft has been sunk 200 ft., where an influx of water necessitated suspending work until pumping machinery is installed. Some rich copper ore, carrying gold has been found at depth.

CALIFORNIA.

AMADOR COUNTY.

Climax.—At this mine, Jackson, P. B. Aiken superintendent, the men are taking out ore and doing development work. More stamps will be put in this summer.

Wheeler.—This mine, near Plymouth, C. K. McCaffrey superintendent, is being pumped out. The ore is to be tested shortly. The mine is owned by the West Penn Mining Company.

BUTTE COUNTY.

Long Mineral Extracting Co.—This company at Oroville, is securing contracts to work black sand and base ores from the companies in that vicinity, and is putting up buildings and machinery.

Magalia Ridge.—The Nimshew Mining Co. is reported to have bought the Lucky Strike mine from N. A. Harris and R. V. Pierce. The Butte Star is paying well under Mr. Wilson, the owner. The Klondike Mining Co., which has bought the Indian Springs mine, is doing considerable development work.

Spring Valley.—The United Gold & Copper Co., which has bought this property at Cherokee, will commence work at once. On the quartz properties it is intended to build a 40-stamp mill. The hydraulic claims will be operated under superintendent A. M. Wilson, as soon as a license is issued by the California Debris Commission. At one time these properties were very productive.

CALAVERAS COUNTY.

Del Monte.—The main tunnel in this mine near Mokelumne hill, was extended 64 ft. in February, at a cost of $17 per foot. The mill was run on ore from the upper levels.

Garibaldi.—The clean-up at this mine near San Andreas was very satisfactory. Seven feet of good gravel are being worked.

Lloyd Gravel.—Final payment for this mine at Central Hill has been made.

Mahala.—A fine ledge has been struck in this mine at Rich gulch. The vein varies from 17 in. to 3 ft.

Mountain King.—This mine, supposed to be on the same ledge as the Royal at Hodson, has been sold to Allen & Littlefield, of San Francisco, for a stated price of $300,000, they having perfected their bond and taken possession. The new owners are reported to have contracted for a 60-stamp mill to be put up at once. W. Parks and the Womble Bros. were the owners of the mine.

Royal Consolidated Mines Co.—The value of the strike in this mine has been greatly exaggerated. On the 1,000 ft. level there is a ledge 40 to 60 ft. wide with high values. The mine is run with a full non-union crew.

Veith.—This mine at Mokelumne hill has been bonded to J. L. Green, who is to commence work in the next three months.

Wilbur-Womble Mining Co.—This mine at Hodson has closed down temporarily, though good ore has been struck in the lower levels. Arrangements are being made for electric power.

ELDORADO COUNTY.

Karolyi.—It is reported that a rich body of ore has been found in this mine near Kelsey, and that a mill will be erected.

New Highland Gold & Copper Co.—A permit has been granted to this company to hydraulic the old Mameluke mine near Georgetown, and pipe is being laid.

INYO COUNTY.

Inyo Development Co.—This company, which is making soda and soda ash will build 30 acres of new evaporating vats this summer. The pumping plant has been moved further out, and other improvements are being made near the lake.

Union.—Five men are doing development work on this mine at Cerro Gordo, but lack of water hinders operations.

KERN COUNTY.

Imperial Mining Co.—This company will start work on the Gasina mine, on Barossa mountain, near Amalie. The mine has several short tunnels and a shaft.

Menlo Mining Co.—It is reported that this company at Millspaugh, expects to erect a large mill and cyanide plant this season. A. C. Burcham, of the Yellow Aster Co., of Randsburg, is the principal owner.

Zenda.—The mill and tramway of this mine at Amalie have been completed, and are in operation.

MADERA COUNTY.

Markle.—A crushing plant is to be installed at this mine at O'Neals, owned by Mr. Markle and Geo. Paden & Co., of Hanford.

MARIPOSA COUNTY.

The group of mines, including the Mountain King, Calendar, Whiteman's, Spring Hill and Mary, has been bonded to H. C. Austin. The owners are to receive $10,000 within 15 months; $30,000 within six months after; and $40,000 the following six months. Operations for development are to begin within 90 days.

White Rock King.—It is expected that a smelter will be put on this copper mine at Lewis, this coming summer. A gasoline engine has been purchased, and work will commence on the property this spring.

PLACER COUNTY.

Gold Run Gravels.—E. F. Ballard, superintendent of this mine at Gold Run, has leased part of the property to Chas. Hund and E. G. Hermann, who are now hydraulicking it. They are using 1,000 in. of water under 150 ft. pressure. The debris is restrained in Cañon creek by a dam.

Three Stars.—It is reported that this quartz mine at Ophir, has been purchased by Captain De La Mar, and will be opened at once.

PLUMAS COUNTY.

Emigrant Hill.—F. M. Conn and S. G. Simpson have applied for a permit to hydraulic this mine near Quincy. The tailings will be impounded.

Mountain Vale.—A snow slide has carried away the small mill of this mine near the head of Hopkins creek.

SAN BERNARDINO COUNTY.

Gold & Silver Extraction Co.—This company, of Denver, is putting up a 300 ton plant at Barstow.

O. K. Mining Co.—This company at Dale, is reported as having let a contract to the Union Iron Works, of San Francisco, for a 10-stamp mill. A cyanide plant is also to be put in.

SHASTA COUNTY.

Delta Consolidated Mining Co.—This company, at Delta, has found a chute of high grade ore in the Pioneer Black Oak claim.

SISKIYOU COUNTY.

Cherry Hill.—The company will commence working this mine as soon as electric power can be obtained.

Doolittle.—At Wingate hill this mine is being worked by Jos. Wells, and plans have been made to extend the Gasquet ditch to increase the water supply.

Minetta B.—This mine at Nolton, is now being worked under royalty by J. C. Wood.

Mount Vernon.—The new owners are taking out good ore from this mine near Yreka. The lower tunnel is in over 1,000 ft.

Spengler.—This claim at mouth of Humbug, A. Smith superintendent, has been started up again. The surface ground is being removed by ground sluicing.

TRINITY COUNTY.

Lappin.—This mine at Deadwood, owned by M. A. Brady, J. F. Tourtelotte and R. E. Cochran, of Weaverville, has been bonded by Mark Manley, of the Fairview mine, representing Philadelphia men.

TUOLUMNE COUNTY.

Black Oak Mining Co.—Scott, Dowe & Co., owners of this mine at Soulsbyville, have bought the canvas plant formerly in use at the Confidence mine.

Cherokee.—This group, with the exception of Carlotta and Pennsylvania, has been bonded by a new company, which agrees to settle all obligations of the old company.

Grizzly.—Wm. Sharwood, of Soulsbyville, has agreed to construct a 20-stamp mill for this mine.

Over.—The shaft at this mine is being put down from the tunnel level, 1,000 ft. from the surface, and is now 50 ft. deep. The mine is owned by Pownall and Conlon.

Soulsby.—Five more stamps are being added to the milling plant of this mine at Soulsbyville.

Starr King.—This mine, on the East Belt, is again in operation, and five stamps are to be added to the mill.

Tuolumne.—A ledge of free gold ore is reported in this mine near Columbia, 1,500 ft. from the entrance to the tunnel, and at a depth of 600 ft.

COLORADO.

CUSTER COUNTY.

Copper Mystery.—The option on this property, which was held by A. H. Sawyer, of Greenland, Mich., has been closed, and final payment made to Scheible & Forney. The property is on Grape creek and was purchased to develop.

Silver Bar.—Large bodies of low-grade milling ore, with rich streaks of silver chloride are reported opened in this property near Silver Cliff, and plans are being matured, it is stated, to erect a mill.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Denbigh.—Local leasers have shipped two cords of milling ores which cleaned up 16¾ oz. gold on the plates.

Derigo.—Denver and eastern men are interested in this property, in the Hawkeye district, near Wide Awake. In driving the lower tunnel it is reported that 17 ft. of milling ore have been opened, which will average 3 oz. gold to the cord. L. D. Godshall, of Denver, is the manager.

Evergreen Gold & Copper Mines Co.—This company, organized with a capital stock of $500,000, Joseph L. Walters, W. C. Hollister and E. B. Berbert, incorporators, has taken a lease and bond on the Evergreen group in the Pine Creek district. Joe L. Walters, of Apex, superintendent.

Gunnell Gold Mining & Milling Co.—The shaft building and large plant of machinery on the Gunnell or pump shaft in Eureka district was destroyed by fire of unknown origin March 18. The total loss will figure up about $50,000, with no insurance as far as can be learned. Boston men bought the property about three years ago, and Frank C. Young, of Denver, Colo., is manager. Employment was

being given to about 50 men, mostly under tribute. The property furnished water for two local stamp mills, and its pumps helped to drain surrounding properties. It is not known whether or not the company will replace the plant.

Kansas-Burroughs Consolidated Mining Co.—During February the shipments of milling, concentrating and smelting ores were 125 cars or 1,065 tons. R. Sykes, Central City, is manager.

Lillian.—Bannon & Co., lessees, have sunk a lift of shaft down now 350 ft., and have about 2 ft. of sulphide ores, carrying values of $30 to the ton.

Pierce.—This property, on Nevada street, is operated under lease and bond from the owners, Senator Henry M. Teller and Hal Sayr, of Denver, by an English syndicate, and developments have been kept up for the past ten months. In the 270 east level some excellent milling ore has been opened up and from 2 to 3 cords per day are shipped. John H. Gower, Denver, is president of the company.

Roderick Dhu Gold Mining Co.—This company is shipping from 2 to 3 cords per day to the stamp mills and a run of 12 days at the New York mill gave retorts of 116.5 oz., valued at about $2,000. The company is also shipping some smelting ores of a very fair grade, and has commenced sinking the Protection shaft a lift of 100 ft. below 320 ft. to connect with the workings from the Roderick Dhu property.

Waltham.—The owners of this property, in Russell district, have been doing considerable development for several months, making only a poor showing. Fifty tons of concentrates treated at the Argo smelters recently returned values of $60 to the ton. The mine has been let out principally under tribute. E. M. Messiter, Central City, is manager.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

The daily output is about 2,500 tons of all kinds of material. The New Monarch is preparing to sink a deep shaft; the new Moffat shaft on Rock hill has been started; the Penrose and Coronado shafts will be sunk from present working levels in a few weeks; the New Harvard shaft is being sunk; the Ibex No. 4 will resume next week.

Allegheny Mining Co.—The main shaft has been leased to Andrew Dyatt, who is repairing old workings and will operate through the 800-ft. shaft of the Mikado property.

Buckeye.—A good streak of 100-oz. silver ore is being followed from the bottom of the 150-ft. shaft. Several thousand dollars' worth of this material, the result of the winter's work, have been shipped.

Diamond Gold Mines Co.—About 100 tons a day of fair grade ore are shipped, running $18 to $20, with a 20% iron excess. The pumps are handling 325 gal. per minute.

La Plata.—A number of lessees are at work shipping a fair grade iron.

New Emmet Mines Co.—Shipments of a good grade iron are being made, and work in new ground continues.

Nil Desperandum.—The Moffat shaft is being cleaned out and re-timbered by new lessees, who will open some of the Rock hill ore shoots.

Ohio & Colorado Smelting & Refining Co.—About 800 tons are daily handled at the Salida plant, while the 12 new roasters are said to do good work.

Penrose.—Retimbering is about completed, and about April 1 it is expected that the shaft will be started to open the ore proven up by diamond drill.

Resurrection Gold Mining Co.—Shortage of water has caused an almost complete shutdown. Arrangements and improvements to be completed this coming month will place the property in a position to produce about 150 tons daily of concentrating ore for its mill.

Starr-Twinkle.—A new company is being formed in Denver to operate these two claims and adjoining territory, and active work commences as soon as the snow is off.

Tiger.—Recent exploration has opened up the old vein in several places, and the operators have a shipment of about 50 tons of rich ore ready.

Tribune Mining & Leasing Co.—This company has just purchased the Ellen property. This mine is now producing 25 to 30 tons daily of fair grade ore. The company is also operating virgin ground on the Tribune claim, near the Antioch.

Vega.—Pennsylvania men who own this large acreage as well as the Diamond group, adjoining, plan extensive development work.

Wild Cat.—Underground work has been started on this property and work from the lower levels will be carried on to catch the Caribou ore shoot.

SAN MIGUEL COUNTY.

(*From Our Special Correspondent.*)

Butterfly-Terrible.—About 40 men are at work in the mine on the Ida vein, and 30 stamps in the mill are dropping, and more ore is milled than at any previous time in the history of the property. The ore body, uncovered in November, is larger than ever before.

Bridal Veil Basin.—Edgar M. Titus, who has charge of the Link and Jumbo, has let a new contract for driving the tunnel 100 ft. on the vein. For some distance the vein has been carrying from 3 to 9 ft. of low-grade mineral. By spring it is expected to have the bore in between 400 and 500 ft., which will give an equivalent number of feet in vertical depth below the surface. The quartz now resembles the white quartz of the Tomboy mine.

SUMMIT COUNTY.

Gold Run Mining & Milling Co.—The Lightburn tunnel, on this company's group at the head of Gold Run, is now in about 2,050 ft. on its way to the 3,000-ft. point.

Old Union Mining & Milling Co.—A carload of ore running well in lead was shipped recently from this property near Breckenridge worked by Keables & Smith.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

Labor Situation.—The executive committee of the Western Federation of Miners has called out all the union miners working on the leases, amounting to about 200 men; some obeyed the call and some did not. In some of the mines where union men went out their places were filled by non-union men.

El Paso Gold Mining Co.—At the annual meeting this week the following directors were elected: S. S. Bernard, Geo. Bernard, J. M. Jordan, W. S. Jackson, P. S. Delaney, J. C. Helm and J. W. Mahoney. S. S. Bernard was chosen president and general manager, George Bernard vice-president, J. M. Jordan secretary and treasurer, and Wm. Bainbridge superintendent. The reports of the officers show the property to be in excellent shape. The production amounted to $583,450, the best year's record in the history of the mine. The tonnage was 14,897 tons of ore, of which 8,720 tons were valued at $27.58 per ton and 6,177 tons at $55.50.

GEORGIA.

CHEROKEE COUNTY.

Brawley.—This property, in Bells district, which was recently sold, is being developed on a considerable scale. An engine, boiler and pumps have been put on the property, and other machinery is expected. It is proposed to go down to a depth of 200 ft. at least. David McDowell, of Acworth, is manager, and Alexander Wienbaum, of Nashville, Tenn., is treasurer for the present owners.

Kellogg.—Preparations are being made to resume work on this property in the western part of the county. It is under charge of Geo. F. Hesselmeyer, of Acworth, as manager. At the present time, the surface is being taken off and passed through a log washer to separate the clay. This is a new process for this region. A Lane mill has been put in to grind the harder portion of the material. It is proposed to introduce the cyanide process here.

HARALSON COUNTY.

(*From Our Special Correspondent.*)

Royal.—This gold mine, 2½ miles south of Tallapoosa, has been under development since March 1, 1903. Driving east and west on the 105 and the 133-ft. levels with No. 13 slugger Grand air drills has proven the ore body to be continuous about 500 ft. on the strike, the ore still holding out east and west. The property is equipped with a Frasier & Chalmers 40-stamp mill, a 5-ft. Huntington mill and Wilfley concentrating tables, having a daily capacity of 100 tons. A cyanide plant is to be installed for the tailings. The oxidized ore from an open cut on the surface is being treated by a double log-washer, which concentrates and prepares it for the stamps and Huntington mill; all material going through ½-in. sizing screen goes to the Huntington mill, the over-size to the stamps. The ore is white quartz, carrying iron pyrites with $8 to $10 per ton in gold. Pumps are raising about 40 gal. of water per minute. The property is operated under lease by the Georgia Gold Mines Co., with Benjamin Akerman in charge. The vein is from 12 to 25 ft. wide, averaging over 15 ft. The deepest development shows the vein over 20 ft. wide, and sinking is to be resumed.

IDAHO.

CUSTER COUNTY.

Greyhound.—The adit on this property is in 365 ft., and an upraise made from the tunnel to the surface. A sawmill has been erected, and it is now proposed to erect a smelting plant and concentrator.

SHOSHONE COUNTY.

(*From Our Special Correspondent.*)

Federal Mining & Smelting Co.—This company elected the following directors at a meeting in New York: Eugene J. Barney, Peter B. Bradley, John A. Finch, F. T. Gates, George J. Gould, Edwin Packard, John D. Rockefeller, Jr., Charles Sweeny, C. D. Warren, Richard Wilson, George W. Young, Horace G. Knowles and E. Parmalee Prentice. The board is substantially the same as before, the only change being E. Parmalee Prentice in the place of William C. Butler. The executive committee was also appointed, consisting of George J. Gould, F. T. Gates, John A. Finch, Edwin Packard and Charles Sweeny. The following officers were elected: Charles Sweeny, president; Edwin Packard, first vice-president and chairman of the board of directors; John A. Finch, second vice-president; Bruce Glendening, treasurer; E. V. Cary, assistant treasurer; F. J. Kliner, secretary; E. J. Roberts, general manager.

INDIANA.

BROWN COUNTY.

(*From Our Special Correspondent.*)

Gold Creek Mining Co.—This Indiana corporation, capitalized at $300,000, has about completed arrangements for mining for gold on Bear creek, and has installed machinery for the purpose. The company's principal office is in Martinsville. H. C. Churchman, E. I. Lewis, R. L. Royse, E. L. Brown and R. L. McNarr are the officials.

GREEN COUNTY.

(*From Our Special Correspondent.*)

A coal seam 4 ft. 7 in. thick is reported struck at a depth of 133 ft. west of Lyons.

LOUISIANA.

ACADIA PARISH.

(*From Our Special Correspondent.*)

Jennings Oil Field.—The Union Oil Co. of Jennings, using 8,000 bbl. of crude per month, is the only refinery operating in Louisiana. Chicago Jennings No. 2, which has been gushing for 6 weeks, is still producing over 2,000 bbl. per day. Mermenta Development Co. No. 3, Rayne Planter No. 1, and Chicago Jennings No. 3, are all down over 1,600 ft., and are expected in every day.

MARYLAND.

Earnings of the Consolidation Coal Co. increased in gross $877,408 for the year, and net receipts increased $709,051. The company reports a surplus of $677,508, an increase of $499,069. The total output of coal was 1,753,783 tons. President Watson called attention to the acquisition of a controlling interest in the stock of both the Fairmount and Somerset coal

companies. The former company controls the Clarksburg Fuel Co. and the Northwestern Fuel Co., the latter owning large docks at Chicago, Milwaukee and Superior.

Consolidation Coal Co.—At the annual meetings of the Consolidation Coal Co., Fairmount Coal Co. and the Clarksburg Fuel Co., affiliated concerns, in Baltimore, H. L. Bond, Jr., H. C. Black and George F. Randolph were elected directors to take the place of L. F. Loree, J. M. Quigley and Charles K. Lord in the Consolidation Coal Co.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

Atlantic.—Wages of trammers and miners have been voluntarily raised $2 and $2.50 per month respectively, making the scale the same as at the other south range mines.

Baltic.—Operations were resumed this week, the men who were out on a strike 24 days accepting the wages offered, which are the same as at the Champion. Improvements recently made at the stamp mill have greatly added to its capacity and efficiency. It is now stamping on an average 2,000 tons of rock daily, or 500 tons per head. It is expected to increase the capacity to 2,300 tons daily.

Champion.—Mining operations are once more under way, the men having accepted the company's offer of $60 and $54 per month for miners and trammers respectively. The new 100-drill air compressor will go into commission as soon as additional boiler capacity has been provided.

Quincy.—This mine produced 1,018.2 tons of mineral in February.

Tamarack.—At No. 5 shaft work is progressing rapidly, and 30 drills are cutting out stopes and drifting from the 31st to 38th levels, south, inclusive. Rock shipments from the shaft average 17,000 tons monthly, and 250 men are employed. The February product is estimated at 520 tons of refined copper.

Trimountain.—Operations have been resumed in all departments, the men accepting the offer of $60 per month for miners, and $54 for trammers and timbermen, together with reductions in house rent and the price of fuel. The production for February was 380 tons of mineral.

Winona.—The production in February was 41 tons of mineral.

Wolverine.—The February output was 474.2 tons of mineral.

COPPER—KEWEENAW COUNTY.

(From Our Special Correspondent.)

Ahmeek.—This property is under the Bigelow management. Sinking is under way in two shafts, and some very rich rock has been taken out. A recent assessment provides $250,000. William Daniell is mining captain, and William E. Parnall, superintendent.

Miskwabik.—Work has been temporarily suspended to permit of the installation of heavier machinery.

COPPER—ONTONAGON COUNTY.

(From Our Special Correspondent.)

Adventure Consolidated.—Operations at No. 3 shaft are confined to sinking and stoping. Sinking has reached a depth of 800 ft., and will be continued to 1,000 ft. A crosscut will then be extended southward to tap the Merchant, North Butler, Butler, Ogima and Evergreen lodes, the latter 800 ft. distant. The Knowlton lode, which is the most productive, is 30 ft. north of the shaft, and is reached at each level by a crosscut through the hanging.

NEVADA.

NYE COUNTY.

(From Our Special Correspondent.)

McNamara Mining Co.—This company, owning one claim adjoining the Tonopah Mining Co., has resumed operations which were suspended in June owing to lack of funds. The mine is equipped with a 60 h. p. steam hoist.

Tonopah Extension Mining Co.—This company is installing an 8-drill compressor plant. The main shaft is down 450 ft., and drifting on the 275 ft. level continues, the vein yielding a fair quantity of shipping and a large tonnage of second class ore.

Tonopah Mining Co.—This company ships about 250 tons of ore monthly until the completion of the railroad, when that quantity will be shipped daily. A small force of men is kept on development work.

West End Mining Co.—This company, owning one claim adjoining the McNamara on the south, has installed a 2-drill compressor plant.

OREGON.

BAKER COUNTY.

New York Consolidated.—Machinery is being installed at this mine at Greenhorn, consisting of a 500 ft. hoist, two steam stamps, pumps and boilers. C. C. Nepple, of Baker City, is manager.

GRANT COUNTY.

Blue Channel Gold Placer Mining Co.—This company is reported to own about 530 acres of placer ground on Big creek near Susanville and to have sunk a shaft 115 ft. to bedrock over which a steam hoist and pump are being installed to handle the blue gravel from the old river channel. Two giants and about 2,000 ft. of pipe are on the ground and will shortly be used.

Cooper.—The tailings of these claims near Grant's Pass are to be worked over by Simpson & Stevenson, who have erected a 30-ton capacity mill, on Elk creek, with which they also intend to do custom work.

JOSEPHINE COUNTY.

Althouse.—Robert Brown and James Camp, of San Francisco, are to build a 6-mile ditch on this property near Grant's Pass which will carry 2,000 miners' inches of water and give 500 ft. gravity pressure to the giants, and a hydraulic elevator will be put in. In the past the tailings were carried by tunnel through the divide and discharged on a flat on the Sucker creek side. The Althouse placers consist of 500 acres of good ground, nearly all of which is old channel, and which lies at a depth of from 15 to 25 ft.

Columbia.—This property at Grave creek has two giants at work and reported getting good returns. The diggings are electric lighted.

Galice Consolidated Co.—This company is working three giants at its Galice creek placer property.

Lone Star Mining Co.—Two giants are being operated at the Wickstrom placers on Pleasant creek by this company which will have water for eight months this season. The ground is reported to average 20c. a yard.

Royal.—This group of hydraulic placers, on Galice creek, formerly known as the Old Channel mines, and owned by the Old Channel Mining Co., of Chicago, are being washed with two giants by J. R. Harvey, formerly superintendent of the Old Channel.

Ruble.—These mines on Coyote creek near Grant's Pass are working with three giants.

Sturgis.—This mine, on Forest creek, near Grant's Pass, which was purchased several months ago by Olmstead & Vance, and completely overhauled and re-equipped by them, is now worked under the new management with a capacity nearly double that of former seasons. Electric light is used for night work.

Takilma Smelting Co.—This company will erect a $250,000 100-ton smelter at Takilma, for the treatment of gold and copper ores. Contracts for construction have been let and work will begin at once. It is hoped to have the plant in operation within six or eight months. Officials of the United States Reduction & Refining Co., of Colorado Springs, Colo., are reported interested in the smelting company. C. L. Tutt, K. R. Babbitt and J. A. Hull, of Colorado Springs, are directors for the first year. The offices will be in Colorado Springs.

Vulcan.—This mine is being equipped with Wilfley concentrating tables from the Mine & Smelter Supply Company.

Wolf Creek Mining & Developing Co.—This company has one giant at work on its Wolf creek property.

PENNSYLVANIA.

Pennsylvania Zinc Co.—This company, with a capital of $2,500,000, has been organized to develop deposits of zinc ore at Friedensville. The ore is quarried and some assays are reported to show pure zinc, running from 30 to 60%. Plans have been completed for the erection of a 25-ton smelter, which will be in operation by May 1. The directors of the company are John G. Carlisle, Robert S. Walker, J. Ensign Fuller, W. M. McMechen, Joseph H. Everett, Willard Brown, Charles A. Gerlach, George P. Foote and Charles W. Mackey.

ANTHRACITE COAL.

Cameron.—This colliery, near Shamokin, at which 1,500 employees have been idle three weeks on account of a mine fire, is resuming work. The fire was extinguished without flooding the mine.

Delaware, Lackawanna & Western Co.—Five of this company's largest mines near Wilkes-Barre were shut down March 16 until April 1 on account of the market.

Richards.—This mine, of the Susquehanna Co., near Shamokin, resumed March 22 after a week's shutdown on account of its being flooded by water poured into the Sioux mine of the Lehigh Valley Co., adjoining, to extinguish a fire.

BITUMINOUS COAL.

Seger Coal & Coke Co.—Work on two coal tipples of this company, with a daily capacity of 200 tons each, is progressing rapidly near Ligonier, and contracts have been awarded for the erection of a coke plant of 200 ovens. Samuel Seger is president, W. E. McMillen vice-president, John D. Seger treasurer, R. D. W. Bruner secretary, and W. G. Cronkright general manager.

SOUTH DAKOTA.

LAWRENCE COUNTY.

(From Our Special Correspondent.)

Black Hills Mining Association.—An appropriation has been made by this organization towards an exhibit to be placed at the World's Fair. The exhibit will consist of a collection of ores, mineral and a five-stamp mill, amalgamating plates and concentrating table.

Horseshoe Mining Co.—Shipments of ore have started from the Ben Hur and Mark Twain mines to outside smelters. The cyanide plant is running continuously.

Lexington Gold Mining Co.—Operations will be resumed on the Spruce gulch property. The present mill is to be remodeled and further experiments made with the slimes. Herman Bischoff is manager.

Wasp No. 2 Mining Co.—Two clean-ups per month are being made at the cyanide plant, aggregating between $25,000 and $30,000. This company's property is said to be under bond to an English syndicate. An extension has been granted on this bond until some time in April.

TEXAS.

HARDIN COUNTY.

A fire at Batson on March 18 is reported to have burned many derricks and a large amount of oil in storage.

(From Our Special Correspondent.)

Batson's Oil Field.—New wells in, are Heywood Oil Co., the Bates well and No. 7, both belonging to the Guffey Co., Higgins Oil Co. No. 1. A new company, the Alert Oil Co., F. J. Alderson, manager, is drilling on the Knight survey. None of the strictly wild cat wells have as yet reached the oil sand. The producing wells number about 40, wells drilling 60, oil in store 900,000 bbl. The completed earthen tankage is about 1,500,000 bbl., but much of it is badly constructed and very wasteful. It is said on good authority that salt water has made its first appearance at Batson in one of the wells in the easterly portion of the field.

JEFFERSON COUNTY.

(From Our Special Correspondent.)

The Texas Co. has shipped the first vessel load of refined oil to New York. The capacity of the refinery is to be doubled.

The Guffey Co. is drilling five wells, and the National Oil Co. three; altogether some 12 wells are drilling. There has been no radical change in the number of producing wells or of the production since last reported, but the pipe line companies have dropped the buying price to 23c., a reduction of 2c. per bbl. Sales are slow, and the market very dull.

Beaumont Oil Field.—T. C. Stribling has brought in another well on the Cladys City tract, at 1,057 ft. The Michigan Diamond Oil Co. wells are being pumped again. The United Oil Fields Co., of Evanston, Ill., has purchased the seven Stribling wells and other Texas property.

LIBERTY COUNTY.

(*From Our Special Correspondent.*)

The wildcat well drilling by Bartlett & Schaeffer, at Dayton, is down 700 ft., and the owners claim to have gone through 54 ft. of oil sand.

UTAH.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Ore Shipments.—For the week ending March 18 shipments aggregated 155 car loads, as follows: Centennial Eureka, 54; Yankee Con., 8; Salvator, 2; Uncle Sam Con., 1; Tetro, 3; Gemini, 29; Bullion-Beck, 5; Grand Central, 14; Lower Mammoth, 10; Mammoth, 16; Carisa, 5; Dragon, 6; South Swansea, 2.

Centennial-Eureka.—Ore shipments from this property of the United States Mining Co. amount to 250 tons per day, the ore coming from the third to the twelfth levels inclusive. The principal working shaft is down 2,000 ft., still in the limestone and dry ground. The lowest level on which ore has been opened is 1,600 ft., where the ore is a copper carbonate, carrying silver and gold. C. E. Allen is general superintendent.

Eagle and Blue Bell.—This group, north of the Centennial-Eureka at Tintic, is controlled by the Bingham Consolidated Mining & Smelting Co., under the management of Duncan McVitchie. The shaft was sunk about 700 ft. and levels were driven to the ore, a distance of 1,200 ft. A cross-cut tunnel from near the collar of the shaft runs 1,200 ft. southerly, and at its breast a vertical winze has been started to connect with the workings below. On the surface a new air compressor is to be installed, to operate the winze hoist and power drills. Raises being made from the 300, 400 and 500-ft. levels in the old workings will form a combination of the winze. The winze starts at approximately 500 ft. below the surface. The ore is silicious, carrying copper, silver and gold. James Creighton is superintendent.

Gemini.—This dividend payer belongs to J. Q. Packard, Jackson McChrystal and others. Mr. McChrystal is manager and reports shipments of 1,400 tons per month of first-class ore, and about 100 tons per day of second-class, the latter mainly from the dump. It is a silver-lead ore in a quartz gangue. The main shaft is 1,650 ft. deep, with a 100-ft. winze below the lowest level. No effort is made to concentrate the ore, as most of it is shipped to the smelters. With greater depth milling will be considered. New Sterling boilers have been installed and the shaft is being sunk.

Tetro.—R. A. Brown, superintendent of the Centennial-Eureka, is supervising development. A shaft has been sunk 200 ft. and a drift runs 350 ft. to the ore, found on a contact between porphyry hanging and limestone footwall. The gangue is both porphyry and limestone. The ore runs from 30% to 35% lead, 30 oz. to 35 oz. silver, and about .03 oz. gold. The lead at present is mostly carbonate, and the silver is present as a chloride. There is some galena. A 200-ft. raise has been made from the 200-ft. level and a 35-ft. winze has been sunk. Since September 7, 1903, shipments have aggregated 75 carloads, the proceeds from which amounted to $40,000. James A. Pollock, of Salt Lake City, is manager.

SALT LAKE COUNTY.

(*From Our Special Correspondent.*)

Bingham Consolidated Smelter.—The copper bullion shipments for the week ending March 18 aggregated about 182,000 lb.

United States Smelter.—The sixth copper furnace will go into commission in about thirty days. Shipments of copper bullion last week aggregated 237,953 lb.

Utah Consolidated Smelter.—Shipments of copper bullion for the week ending March 18, aggregated 300,280 lb.

TOOELE COUNTY.

(*From Our Special Correspondent.*)

Buckhorn.—This mine, at Ophir, is being opened again by the Western Exploration Co. Extensive bodies of milling ore have been developed and a mill is contemplated this year. W. F. Snyder, of Salt Lake, is manager.

Ophir Queen.—At the annual meeting William S. Lang was elected president, G. W. Topliff vice-president, Samuel Crawford secretary and treasurer. The mine is at Ophir, adjoining the Ophir-Hill mine. A hoisting plant was recently installed.

SUMMIT COUNTY.

(*From Our Special Correspondent.*)

Park City Ore Shipments.—During the week ending March 18 the Daly-West shipped, 2,710,000 lb.; Ontario, 417,000 lb., and Keith-Kearns, 230,000 lb.

WASHINGTON.

FERRY COUNTY.

(*From Our Special Correspondent.*)

Republic Ore Shipments.—For the week ending March 23 shipments were: Mountain Lion, 980 tons; Knob Hill, 120 tons; Quilp, 600 tons; Zala M., 60 tons; total, 1,760 tons.

Quilp.—This company has practically closed, having failed to secure an outlet for its ore. A dividend of 1c. a share, or $15,000, was declared to be disbursed April 15.

FOREIGN MINING NEWS.

AFRICA.

TRANSVAAL.

The gold production of the Transvaal in February is reported at 289,502 oz. fine gold, an increase of 678 oz. over January. For the two months ending February 29, the total was 578,326 oz., against 395,794 oz. for the corresponding period in 1903, showing an increase of 182,532 oz. this year.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—For the week ending March 12 shipments aggregated 15,865 as follows: Granby, 10,920; Mother Lode, 4,000; Emma, 40; Senator, 120; Oro Denoro, 780. Total for the year to date, 166,810 tons.

BRITISH COLUMBIA—NORTH-WEST KOOTENAY DISTRICT.

Kingston.—This mine, on Lexington mountain, Lardeau district, has been sold to an English syndicate for $100,000. Among Oregon people interested in the deal are Governor Chamberlain, H. L. Pittock, L. H. Burton, all of Portland. The property consists of 250 acres of placer ground, and the new owners will begin work at once.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—For the week ending March 12 shipments amounted to 9,486 tons as follows: Le Roi, 5,146; Centre Star, 1,710; War Eagle, 1,530; Kootenay, 120; Jumbo, 250; Le Roi No. 2, 670; White Bear, 60. Total for the year to date, 92,451 tons.

BRITISH COLUMBIA—VICTORIA DISTRICT.

Copper Canyon.—J. H. Brownlee has purchased the controlling interest in this group on Mt. Sicker, and is to develop it at once.

BRITISH COLUMBIA—YALE DISTRICT.

Portland Mining Co.—Arrangements are reported completed for the installation of a complete mining plant on this group at Aspen Grove, which will cost about $35,000. John E. Bate is the managing director. The company has several thousand tons of ore on the dump.

MINING STOCKS.

(Full quotations given on pages 505 and 506.)

New York, Mar. 23.

There is still some uncertainty as to the future stability of the stock market, notwithstanding the concerted action on Tuesday to bull the specialties. Some surprising advances were made on that day. In the copper section Amalgamated on increased sales was well protected, and by systematic jumps rose from $46.875 to $49.25 in a few days, closing on Tuesday at $48.25. Even Anaconda, which is seldom traded in, showed activity, and advanced to $16.75, but later reacted fractionally. Greene Consolidated, of Mexico, is gaining support on curb, and this week moved up to $11⅜. An odd lot of United, of Montana, was sold at $6. White Knob, of Idaho brought $8.125, and British Columbia, $2.625@$2.25.

Horn Silver, of Utah, made a sale at $1.25, while Ontario was exchanged at $4.25.

Portland, of Cripple Creek, Colo., moved at $1.85, and Elkton at 65@67c.

The Comstocks are shuffled for a profit among traders, as outside investments are rather discouraged by the battery of assessments which in several instances are at a higher rate than the previous call. Consolidated California & Virginia held at $1.85, but Mexican lost 30c. to $1.90, and Caledonia brought $1.20. Comstock Tunnel bonds are again in evidence, selling up to 12 per cent.

Boston. Mar. 22.

(*From Our Special Correspondent.*)

Stagnation characterizes the local mining market. It is the same old story; lack of interest. Copper shares look attractive and something could be done in them if the right parties were to take hold of the market. The metal situation looks particularly bright, brokers are carrying few stocks and money is plentiful and cheap. At present the gas hearing in the court is absorbing considerable attention and some of the leading lights are in constant attendance to the sacrifice of the market.

Outside of a further break in Daly-West and a sharp advance in American Zinc there is little to comment upon. The former touched $24.25 for an odd lot, but recovered to $25.75. The price a week back was $30.75. There have been considerable offerings of the stock for western account, while the traders have also helped along the decline.

American Zinc took a $2 jump Monday, advancing to $10. There is no particular news to account for the advance except that the stock is so held that it can be advanced easily.

Utah holds steady around $34, but is exceedingly dull. Dominion Coal advanced $6.25 to $61, reacting $2. Buying orders from Canadian sources were responsible for the sharp rise. Copper Range has been firm and more active, touching $42.87½ Monday, with reaction to $41.50 to-day. Parrot is firm around $23, Osceola around $57.25 and Mohawk rose to $36.50 on the annual report, which shows a surplus of $69,405 from last year's operations.

Boston Consolidated has again been active on the curb, selling up to $6.25. The company shipped 3,917 tons of ore to the Bingham smelter last month, which netted $5.51 per ton. A reminder of old days was the activity in Pioneer-Lynn on the curb. It rose from 13 to 72c. per share on large dealings. Options on the stock are being solicited at $2.75 net for 90 days from May 1st.

Colorado Springs. Mar. 18.

(*From Our Special Correspondent.*)

The mining stock market on the local exchange closed the week in poor condition, prices declining steadily, though not heavily, since the first of the week. This is probably due in a measure to a revival of the reports of further labor troubles in the Cripple Creek district, which are unfounded.

Companies owning property on Ironclad hill and vicinity have of late been besieged by men who desire to secure leases, and a period of much activity is in store for that section of the camp. This is the result of the strike of bonanza ore made in the W. P. H. claim. That other parts of the camp can also contribute bonanza ore has been demonstrated by the les-

sees on the Empire State property on Bull hill, who within the past few days opened a seam of talc which is returning from $30 to $50 per pound. The stuff is being stored in a bank vault at Cripple Creek, where it will be assayed and sold. The Stratton properties are being opened up, and the camp generally presents a very active appearance. While it cannot be said that the prospect for higher prices in mining securities is particularly encouraging, at the same time indications point to the fact that they will not decline materially in the immediate future.

Salt Lake City. Mar. 19.

(From Our Special Correspondent.)

The mining stock market in Salt Lake City shows no tendency to improve. The trading of the past week was confined largely to the lower priced shares. Some Daly-West was brought out at a reduced figure, the eastern market having slumped. The campaign of development at the Daly-Judge continues and the stock holds remarkably firm. Some buying of La Reine was done early in the week when it became known that the control of the property was to pass into the hands of new management. Tetro still continues to hold its own. Yankee Consolidated rose to 52c. during the week, but sank again toward the end. A single block of Silver King sold at $65 per share.

San Francisco. March 10.

(From Our Special Correspondent.)

Prices have been rather steady for the Comstocks, but chiefly on light trading. For most of the week it has been chiefly a "chipper's" market. There has actually been another dividend, Silver Hill having declared one of 5c. a share payable March 21.

Some quotations noted are: Ophir, $5@$5.25; Mexican, $1.90@$2.05; Consolidated California and Virginia, $1.80@$1.85; Caledonia, $1.20; Sierra Nevada, 65c.; Gould & Curry, 45c.; Potosi, 27c.; Chollar, 20c, per share.

The sworn statements of the mining companies, as filed in their offices this week, show cash on hand March 1 as follows, with all expenses paid, unless otherwise noted: Alpha Consolidated, $2,445; Alta, $727, with liabilities of $4,067; Andes, $3,928; Belcher, $1,475, with February expenses partly unpaid; Best & Belcher, $136, with indebtedness of $3,500; Bullion, $2,958; Caledonia, $1,978, with February expenses unpaid; Chollar, $792; Confidence, $616, with February expenses unpaid; Consolidated New York, $1,700; Consolidated California & Virginia, $11,341; Consolidated Imperial, $789; Challenge Consolidated, $3,339; Crown Point, $1,657; Exchequer, $723; Gould & Curry $5,842; Hale & Norcross, $3,124; Julia Consolidated, $289; Justice, $2,359; Ophir, $55,084, with 14 car-loads of ore in transit; Overman, $787, with February expenses unpaid; Savage, $8,750; Sierra Nevada, $1,802; Silver Hill, $12,608; Standard Consolidated, $95,102, with February expenses and February clean-up to be accounted for; Syndicate, $2,622; Union Consolidated, $2,359; Utah Consolidated $3,854.

Mexican reports no cash on hand and an indebtedness of $2,198.

On the San Francisco & Tonopah exchange business was good and prices steady. Tonopah of Nevada sold at $6.65; Montana Tonopah, $1.25; Tonopah Belmont, 60c.; Tonopah Midway, 38c. per share.

On the California exchange business in oil stocks was more active. Kern Oil sold at $5; Home, $1.30; Apollo, 46c.; Oil City, 35c. Business in Oil City was very active indeed, with a strong buying demand.

San Luis Potosi. Mar. 16.

(From Our Special Correspondent.)

Exchange on New York rose from 216½ to 218, but closed Saturday at 217. In mining stocks dealing was more active, though the bear movement still continues. Dos Estrellas dropped from $1,595 to $1,525; Victoria del Oro advanced from $127 to $158, on the rumor of a rich strike but fell back to $148 when rumor was not substantiated. Equidad, of El Oro, $6; Luz de Borda, $64; Nuevo Nacional, $30; La Union, $52; Mexico Venture Syndicate, $11, and Cuanhtemoc, $35. Santa Gertrudis, of Pachuca, $83.50, and San Felipe de Jesus, $17; Providencia of Guanajuato, $70; La Paz of Matehuala, $150; Barreno, San Luis Potosi, $47, and La Union of Oaxaca, $48.

COAL TRADE REVIEW.

New York, Mar. 23.

ANTHRACITE.

The arrival of some really spring-like days, and the near approach of April 1 have combined to minimize interest in anthracite. There is a little buying for immediate wants, and at points where supplies are low, as in Canadian territory and at some places beyond Cape Cod, there is eagerness to get coal. The total amount of business for the balance of the month will, however, be small. Regarding the discounts to be made April 1, the situation is somewhat clearer than last week, yet hardly as clear as it might be. It is said that no circulars have yet been issued, but that the Lehigh Valley, the Lackawanna, the Erie and one or two other interests have given notive that there will be the usual reduction of 50c. a ton to encourage buying in April, and that they are prepared to book orders on that basis. The Philadelphia & Reading and the Central Railroad of New Jersey interests say less, and as a result a lot of newspaper stories have been going the rounds to the effect that there was serious dissention among the large producing companies. So far as can be ascertained these stories are based merely on guesses, and it is possible that the Philadelphia & Reading, which was named in the suit before the Interstate Commerce Commission last year as the head of the so-called coal trust, is holding back this year to let some other company have the honor of naming spring discounts. At any rate, there is nothing in the statement of one sensational newspaper that coal is to be higher. The outlook is that business will not be as active during the spring months as last year, in spite of the great tonnage burned during the winter. Whether trade will be as dull next fall as it was last remains to be seen, and at any rate the actual strength of the present discount arrangement cannot be definitely known until the trade has passed through at least one really bad year.

Trade in the Northwest has fallen off greatly and will continue light, as dealers do not care to have large stocks on hand May 1. Consumption during the winter was very heavy, probably 30% in excess of any winter in the history of the trade. In Chicago territory dullness prevails. The railroads are in better shape than in many weeks for through shipments, but little coal is wanted. Supplies on dock though low, are ample to last until the opening of navigation. In Canadian territory those roads that have had shipments delayed for weeks by snow, are now in shape to give fair service. Along the Atlantic seaboard trade is quiet, except at those points beyond Cape Cod, where normal winter supplies were used up by the cold weather. Conditions favor the coastwise movement of coal, and vessels are already arriving at shipping ports to take coal at April prices.

BITUMINOUS.

In the Atlantic seaboard bituminous trade deman continues large, although some consumers are delaying their orders with the intention of getting coal at the new prices after April 1. As a rule these prices are from 25 to 50c. lower than those named last year. In some cases the reduction is even greater, thus there are reports of coal being sold at Norfolk and Newport News for $2.35 per ton, this representing about 90c. for the coal at the mines.

A considerable tonnage on season contracts has ben taken by producers during the week, and contracts will be closed right along from now on. Some producers already report that they have taken all the contracts they care to. As regards the labor outlook, interest centers on the action of the Altoona convention, which is, of course, of more direct importance to the seaboard trade than the result at Indianapolis. There is a feeling among producers that, owing to the keen competition of coal from West Virginia and from non-union districts in other States, there should be a larger proportionate deduction in wages for central Pennsylvania than for the districts affected by the Indianapolis agreement.

In the far East consumers are calling for considerable coal to eke out stocks depleted by the hard winter. Along Long Island sound there is a fair demand, but in that territory are most of the consumers who are holding off until April 1 before buying. New York harbor trade is fairly active; with quicker transportation and the passing of the fear of a general strike, prices have fallen and fair grades of Clearfield are now selling at $2.85@$2.90, f. o. b. New York harbor shipping port. All-rail trade is larger and is increasing. Transportation from mines to tidewater is good, coal running through in less than a week. Car supply at the mines is between 25 and 40% of the demand. In the coastwise vessel market vessels are in fair supply. Current rates from Philadelphia are $1.10@$1.15 to Boston, Salem and Portland, and $1 to Providence, New Bedford and Long Island sound. From New York harbor ports the current rate is $1 to points beyond Cape Cod.

Birmingham. Mar. 21.

(From Our Special Correspondent.)

The Alabama coal market is active and the production is heavy. Some 1,500 tons of coal have been going from this district daily to Mexico by way of Pensacola, the Mexican Central Railroad getting its supplies from this State. Coal mined at Stouts' mountain and at Blocton has been used in this trade, as the coal is hard and can stand the long travel and unloading. An effort was made during the past week to get the miners belonging to the United Mine Workers of America in this State to hold their convention in May instead of June, so that the matter of contracts for the ensuing year could be settled on or before the last of June. The miners announce that this request cannot be granted, anyhow, this year, as the by-laws call for the meeting on the second Monday in June. The coal operators thought that by having the meeting in May that the making of contracts for the last half of the year need not be held up as they are now. The present contract expires June 30. It is not believed that the operators are willing to renew the contract as it now stands. The miners, on the other hand, will hardly ask for a flat basis in the place of the sliding scale.

The Sloss-Sheffield Co. has rebuilt its coal washer at the West Blossburg mines, in the western part of Jefferson county, at a cost of $15,000. A Ramsey washer with from 800 to 1,000 ton daily capacity has been erected and work will be started this week. Announcement is made that new mines are to be opened in Shelby and Marion counties. In Shelby county two shafts will be opened at once, while in Marion county the Frisco System will build an extension to some property in the vicinity of Brilliant, where the Aldrich Mining Co. has mines now in operation.

Chicago. Mar. 21.

(From Our Special Correspondent.)

The flatness of the market applies to eastern and western coals alike. Dealers in smokeless are encouraged by the substitution of smokeless for cheaper western coal in many of the office and flat buildings of the city, through the prosecution by the city of violators of the anti-smoke ordinance. Illinois and Indiana are suffering by the slack demand and prices have dropped. Hocking is perhaps as firm as any grade, but dealers in that, too, are complaining. Youghiogheny is in fairly good demand by comparison with other grades, but not in comparison with previous records. Everybody seems to have enough coal. Quotations are: Smokeless, $2.90@$3.50; Hocking, $3.40@$3.75; Indiana and Illinois, $1.75@$2 for run-of-mine; $1.50@$1.70 for screenings, and $2.10@$3 for lump.

It has been decided that the base car price of anthracite for the year between April 1, 1904, and April 1, 1905, shall be $6.50, as in the year just expiring, with similar discounts of 50c. in April, 40c. in June, etc., to September 1, when the full base price applies. This applies to egg, stove and chestnut, with grate coal 25c. less. This announcement has been made by the agents of the coal mining companies to local agents and quiets the talk of a reduction of 50c., to the base price in the year prior to April 1, 1903.

Cleveland. Mar. 22.

(From Our Special Correspondent.)

One of the most interesting features of the coal trade in this territory during the past week was the action of the railroads on the cargo coal rate. A meeting was held at Pittsburg of all of the lines representing the lake trade. Shippers had demanded a reduction in rates and some of the railroads wanted to bring about an advance. Final action was not taken, but the understanding is that a consensus of opinion favored a stable rate throughout the year on the same basis as the rates charged last summer.

There is a good demand for coal of steam grade. The opening of factories and the general improvement of the industrial line in this territory has caused more demand for coal. Good steam product is running about $1.15@$1.20 at the mine in the Pittsburg district, and about $1.20@$1.25 in the Ohio field. Slack is also in good demand, with a limited supply. The price is running about $1 at the mine.

The coke shortage seems to be worse than ever. The market has been held down by the scarcity of cars. The result is that the coke market is stiffening, but with no signs of a change in the prices, which continue to be $2.25 @$2.50 for 72-hour Connellsville coke. High sulphur cokes are running about $2.15. The beet furnace coke is running $1.55 at the oven.

Pittsburg. Mar. 22.

(From Our Special Correspondent.)

Coal.—A two-year contract was signed yesterday by the United Mine Workers and the operators, parties to the interstate agreement, which includes Western Pennsylvania, Ohio, Indiana and Illinois. The ultimatum of the operators calling for a reduction of 5.55% in the mining rate was accepted by the miners by a vote of 98,514 to 67,373. The Pittsburg district dead-work scale is yet to be arranged, but no difficulty is anticipated. The new agreement goes into effect on April 1 and before that date the leading interests in this district will meet and arrange prices for the year. It was given out to-day that the new rates will probably be as follows: Run-of-mine, $1.20 a ton; ¾-in., $1.30; 1¼-in., $1.40; slack, 80c. The present selling price of run-of-mine coal is $1.40. These prices are f. o. b. mine. The railroads have refused the request of the operators to reduce the freight rates to the lake ports and a representative of the Pittsburg Coal Co. declared that this will result in a falling off in shipments from this district to the northwestern markets. It is contended that with a lower mining rate Illinois operators will be able to compete for that trade.

Connellsville Coke.—The coke market continues to improve and prices of standard Connellsville coke are higher. Furnace is quoted this week at $1.75@$1.85 and foundry at $2.25 @$2.50. Production according to the last report was 211,726 tons, a gain of over 8,000 tons compared with the previous week. The shipments for the week were 8,648 cars, a gain of 26 cars; they were distributed as follows: To Pittsburg and river points, 3,346 cars; to points west of Pittsburg, 4,020 cars; to points east of Everson, 1,280 cars.

San Francisco. Mar. 10.

(From Our Special Correspondent.)

The local trade continues quiet, with good supplies. Prices show little or no change.

Pacific coast coals in large lots to dealers are quoted as follows: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; white ash, $5.25. For Rocky mountain coals, ex-car, to dealers, prices are $14 for Colorado anthracite, $11.50 for Castle Gate, Clear Creek, Rocky Springs and Sunnyside. Eastern coal is still nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland, with very high stocks. Foreign coal in cargo lots is quoted at $13 for Welsh anthracite, $8.50 for cannel, $7.50 for Wallsend and Brymbo.

Foreign Coal Trade. Mar. 23.

Imports of coal into Germany for the month of January are reported as follows, in metric tons:

	1903.	1904.	Changes.
Coal	358,709	390,021	I. 31,312
Brown coal	548,802	526,882	D.21,920
Coke	35,103	41,255	I. 6,152
Total	942,614	958,158	I. 15,544

Imports of coal were chiefly from Great Britain; of brown coal (lignite), wholly from Austria.

Exports of coal from Germany in January were as follows, in metric tons:

	1903.	1904.	Changes.
Coal	1,648,875	1,572,570	D.76,305
Brown coal	1,822	1,658	D. 164
Coke	208,278	208,132	D. 146
Totals	1,858,975	1,782,360	D.76,615

Exports of coal were chiefly to Austria and Holland; of coke to Belgium and France. There were 2,370 tons coke shipped to the United States this year.

Exports of fuel from Great Britain for the two months ending February 29 were as follows, in long tons:

	1903.	1904.	Changes.
Coal	6,777,156	6,469,943	D. 307,213
Coke	110,295	108,018	D. 2,277
Briquettes	98,187	207,007	I. 108,820
Total	6,985,638	6,784,968	D. 200,670

In addition to the exports above, there were 2,589,559 tons of coal sent abroad for the use of steamers engaged in foreign trade, against 2,578,307 tons last year; an increase of 11,252 tons.

The exports to the United States are reported as follows:

	1903.	1904.	Changes.
Atlantic coast ports	864,964	16,277	D. 848,687
Pacific coast ports	2	11,484	I. 11,482
Total	864,966	27,761	D. 837,205

The changes show the extraordinary nature of the movement last year.

Messrs. Hull, Blyth & Co., of London and Cardiff, report under date of March 11, that the coal market remains very firm, with a decidedly upward tendency for bests, which are now getting very scarce for March-April delivery. Quotations are: Best Welsh steam coal, $3.90; seconds, $3.78; thirds, $3.60; dry coals, $3.60; best Monmouthshire, $3.30; seconds, $3; best small steam coal, $1.98; seconds, $1.86; other sorts, $1.62.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, both exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½% discount.

Mediterranean freights are rather easier in tone, while other directions are unchanged. Some rates quoted from Cardiff are: Marseilles, $1.30; Genoa, $1.44; Naples, $1.41; Las Palmas, $1.44; St. Vincent, $1.56; Rio, $2.40; Santos, $2.52; Buenos Ayres, $1.92.

IRON TRADE REVIEW.

New York, Mar. 23.

Reports from the iron trade this week are much more encouraging, and it begins to look as though a revival had really set in. In pig iron the market shows a gradual steadying, though without any marked rise in prices. The United States Steel Corporation has exercised its option for additional pig iron from the Bessemer Steel Association and W. P. Snyder & Co., and has also purchased some iron from merchant furnaces which will bring the total of its outside buying well up toward 200,000 tons. It is also stated that the Republic Iron & Steel Co. has bought 35,000 tons from an outside furnace, giving ore in exchange. The southern furnaces have generally made an advance, $10 Birmingham being now asked for No. 2 foundry.

Finished materials also show an improvement in demand, though few large contracts have been placed and the railroads are still holding back. Nevertheless there is a perceptible steadying in the market, and in some lines, especially wires and bars, there has been an improvement in prices.

The tin-plate companies have arranged with the Amalgamated Association for another decrease in rates, making in all 20% since January 1. It is understood that the association accepted this reduction in view of the promise of a large increase in production.

The important point is the decided improvement in sentiment, which points clearly to a better and freer market.

British Iron Trade.—Exports of iron and steel from Great Britain for the two months ending February 29 are valued by the Board of Trade returns as below:

	1903.	1904.	Changes.
Iron and steel	£4,723,931	£4,383,664	D. £340,267
Machinery	2,855,955	2,946,241	I. 90,286
New ships	482,694	442,093	D. 40,601
Total	£9,062,580	£7,771,998	D. £290,582

The more important items of iron and steel included in the exports were as follows, in long tons:

	1903.	1904.	Changes.
Pig iron	165,697	106,260	D. 59,437
Bars, rods, etc.	19,391	18,188	D. 1,203
Rails	88,067	81,245	D. 6,822
Sheets	55,356	62,637	I. 7,281
Tin-plates	46,173	52,330	I. 6,157

Exports of pig iron to the United States were 10,302 tons this year, against 69,734 tons last year.

Imports of iron and steel into Great Britain for the two months were 191,433 tons, against 203,149 tons in the corresponding period of 1903; a decrease of 11,716 tons. Leading items of imports were 17,862 tons pig iron; 67,089 tons of steel blooms and billets; 23,914 tons wrought iron bars and shapes; 33,342 steel bars, angles, etc.

Imports of iron ore were 857,486 tons, against 1,097,438 tons last year; a decrease of 239,952 tons. Of the imports this year 662,131 tons were from Spain.

Birmingham. Mar. 21.

(From Our Special Correspondent.)

Pig iron market conditions in the Southern territory are quite satisfactory right now, prices being stronger than at any time in the last eight weeks, while the demand is steady, with shipments heavy. No. 2 foundry is now firm at $10 per ton, and there is yet an upward tendency. Furnace companies in this section of the country have succeeded in selling a large amount of iron since the changed conditions set it. Sales have been made on which delivery will continue for four months and longer to come. Enough iron has been sold ahead to warrant the firm demand for $10 for No. 2 foundry, and the prediction is made that before the end of the month $12 may be asked. The Sloss-Sheffield Steel & Iron Co. during the past week announced that there was no active search being made for business, but only such orders as were being tendered were being dealt with. About the first of the past week warning was heard of the probability of $10 iron. Before the middle of the week small-lot sales at that price were announced. Sales agents throughout the country were informed that the $10 rate had been instituted, and a still later message announced that the aggregate number of orders had been received to warrant a cessation in working for business.

The Republic Iron & Steel Co. will blow in its third and last furnace at Thomas the first of next week. W. H. Hassinger, vice-president and southern manager of the Republic Co., states that the furnace has been practically rebuilt.

The railroads in this territory are doing better in the way of prompt handling of the product. The report of the Alabama Car Service Association for the month of February, 1904, shows an increase over the same month of last year of more than 10,000 in the number of cars handled.

The following pig iron prices prevail: No. 1 foundry, $10@$10.25; No. 2 foundry, $10; No. 3 foundry, $9.50; No. 4 foundry, $9; gray forge, $8.50@$9; No. 1 soft, $10@$10.50; No. 2 soft, $10.

Trouble with labor in the open-hearth department of the steel plant of the Tennessee Co. at Ensley caused considerable interruption in the work during the past week, and the entire plant has been affected. It is believed that some arrangements will be made with the men so that the plant can go to work steadily again. The men in the open-hearth department returned to work a few weeks ago at the 15% decrease in wages.

There is some minor trouble at the Bessemer rolling mills, belonging to the Tennessee Co., the bar mill being affected. The plant is running, however.

Chicago. Mar. 21.

(From Our Special Correspondent.)

The upward tendency in the pig iron market is increasing, and things look better than they have for a long time, to the seller of both northern and southern. Sales have been large in the last week, and there has been an advance of 50c. in southern, with northern 25 to 50c. over last week's prices. Most of the iron sold is for the second and third quarters of the year, though occasionally a sale extends into the fourth quarter. From the general tone of the market, it looks as if the climb upward would be a long, steady one, with the possibilities of a slip backward removed by the adjustment of production to the needs of consumption through the closing of furnaces. With these furnaces capable of being brought into production again at short notice, the possibilities of over-production again are of course always to be borne in mind, but proprietors of these furnaces, doubtless, will be cautious, for a considerable time.

It is estimated that sales for the week have amounted to 50,000 tons. Southern is at $10 Birmingham, or $13.85 Chicago, for all but the largest sales, which may have been made 25c. under this figure. Northern brings $14@$14.25, against $13.75 last week. The preponderance of sales is largely southern, as heretofore.

Coke is firm, holding up to $4.90 for 72-hour Connellsville. There is no surplus on track and shipments are again well regulated to demand.

Cleveland. March 22.

(From Our Special Correspondent.)

Iron Ore.—The market for iron ore seems to have improved with the heavier production of pig iron, but it has not brought out any definite action by the Ore Association. Such action is expected, however, about April 1, when the association will hold another meeting. Meanwhile the pig iron men are producing in the dark. Vessel owners are trying to convince the shippers that at least last year's rates ought to be paid, and are making a demonstration to scare the shippers into making a settlement. The latter are not disposed to make any fancy offers of rates while the prospects are that there will be a light demand for tonnage.

Pig Iron.—The demand for pig iron has been steadily on the increase. The demand has been primarily for material for delivery between now and July 1, with some demand as far ahead as October 1. The general call, however, has not extended to second-half delivery. Prices have stiffened, and now $13 in the Valley is the minimum. There is some talk of $13.50 in the Valleys, but this has not been realized. There has been a better demand for Bessemer, the smaller consumers coming in to cover their needs. The market is in a strong position. Basic has been under inquiry, but no sales have been reported. The market is represented by a quotation of $13 in the Valleys for bessemer and basic.

Finished Material.—The market for the lighter grades of material has been buoyant. This is true especially of bar steel and hoops, both of which are in big demand.

Structural is in good demand, but nothing of importance has been done yet. Plates are in much the same state as structural, there being a good demand, but no material change in the attitude of buyers toward the market. The price holds at 1.60c. Pittsburg. The demand for billets has been strong, and the talk of cutting has disappeared. The market holds steady on the basis of $23.50 Cleveland.

Old Material.—The tendency of the market is upward. The demand for scrap and the scarcity of it inclines the dealers to make advances.

New York. Mar. 23.

Pig Iron.—The local market is somewhat inactive and prices of Northern iron have advanced again. We quote at tidewater as follows: No. 1 X foundry, $15.90; No. 2 X foundry, $15.20; No. 2 plain can be had for 50c. less; while gray forge is selling around $14.20. For Southern irons on dock quotations are: No. 1 foundry, $14.25; No. 2 foundry, $13.75; with lower grades in proportion. No. 1 soft can be had at about $14.25, and No. 2 soft at $13.50.

Bar Iron and Steel.—Business is improving. Refined bars are quoted at 1.45@1.50c., in large lots, with steel at 1.50c. Common iron bars can be had for 1.35c.

Plates.—The local market is very quiet. Bids for the Staten Island ferry boats will be opened March 28. It is likely that no one yard will undertake to build all five boats in the time given—one year. Sheared plates are quoted as follows: Tanks, 1¼-in. and heavier, 1.76@1.80c.; flange, 1.95@2.05c.; marine, 2.10@2.15c.

Steel Rails.—The quotations remain $28 for standard sections, f. o. b. mills. Light rails are lower than they were. We quote, f. o. b. eastern Pennsylvania mills as follows: 12-lb., $27; 20-lb., 25-lb., 30-lb. and 35-lb., $25; 40-lb. and 45-lb., $24.

Structural Material.—With no change in the troubled condition of the building trades local buying is light. Large lots at tidewater are still quoted at 1.75@2cg. for beams, angles and channels.

Philadelphia. Mar. 23.

Pig Iron.—The recent placing of a large amount of work in machine shops and foundries has stimulated both orders and inquiries for various kinds of crude iron. All of the machinists and founders who have secured business, including the larger engineering plants in this territory, have either bought iron or are now figuring with makers, and the purchases that some of them have already made indicate clearly that they mean to cover their requirements fully. There is also more inquiry this week for southern iron, and two or three good sized transactions have just been closed. The tone of the market, therefore, is stronger, and all of our brokers and agents speak with much more confidence. The mills are also turning out more iron, and this is shown in the purchase of large blocks of both northern and southern. The lowest quotations have already been withdrawn, and parties who secured options two or three weeks ago have been notified that they must decide at once what they propose to do. The options would be cut off instantly, but the parties holding them are big buyers, and understandings exist between makers and these buyers which forbid snap judgment. While there is no pronounced advance, there is a much stronger tone in the market, which is shown in the quotations given to-day to parties who have just entered the market. Quotations may therefore be safely given at $15.75 for the better makes of No. 1 X and $15.50 for the better grades of No. 2 X. No. 2 plain is still quoted at $14.50 for northern, and 50c. less for No. 2 southern by rail; standard gray forge was quoted to-day at $14, but from 25 to 50c. less would be taken for some brands. Ordinary gray forge is available at $13 for the present; basic is strong at $14.

Billets.—Sales of billets of special composition were made this week at $25.50; all weakness has departed, and the best price at which contracts can now be placed is $24.50.

Merchant Bar.—All of our smaller interior mills have had a good week in new orders, and there is quite a degree of activity throughout our entire territory. A further advance is expected.

Plates.—The plate branch of the trade is still dragging a little. Tank steel ranges from 1.78½ to 2c.; flange and boiler plate, 1.88½c.

Structural Material.—There is a great deal of expectation and a good deal of confidence, but there is not much business, excepting in the ordinary retail way.

Old Rails.—The high figures quoted for old iron rails are holding up some good business, but holders decline to consider any offers below $17.50.

Scrap.—Practically all the steel scrap in sight has been cleaned up with a few days and there are very urgent inquiries for No. 1 railroad, for which $18 is asked.

Pittsburg. Mar. 22.

(From Our Special Correspondent.)

There has been a remarkable strengthening of the iron and steel markets during the week and the activity that developed after the United States Steel Corporation began buying outside iron is increasing. The minimum price of bessemer pig iron for delivery during the first half is $13.50, Valley furnaces, and to-day a producer predicted a rate of $15 by July 1. A sale of 2,500 tons was made a few days ago at $13.35 and this was immediately followed by a sale of 2,600 tons at $13.50. Both foundry and forge iron has stiffened and prices in all grades are advancing. All the furnaces in the Pittsburg and Valley districts will be in full operation before April 1. A number of them are out of the market for first-half delivery, and according to reports to-day there is but little bessemer iron to be had in the Valleys for April or May shipment at any price. It has just been learned that the Steel Corporation in addition to its purchase of 100,000 tons from the Bessemer Pig Iron Association and 30,000 tons from W. P. Snyder & Co., also bought a lot of 7,000 tons from one merchant furnace and a lot of 5,000 tons from another for prompt shipment. There is now no doubt but that it will exercise its options for 30,000 tons from the association and 15,000 from the Snyder interest on April 10, which will make the total purchase of outside iron 187,000 tons. It is reported to-day that the corporation is still in the market for iron and may swell the total to 200,000 tons. The pig iron deal of the Republic Iron & Steel Co. is still the subject for various reports. It is reliably stated that the deal was made before the corporation entered the market and was for 35,000 tons of bessemer iron with a Valley furnace and was an exchange deal for ore.

The steel market shows great improvement, and all the mills in the Pittsburg district are busy. Bessemer billets and sheet bars are in demand and all talk of price shading has disappeared. It is impossible for some concerns to fill orders for sheet-bars on contracts and one large interest refused to consider an order for 5,000 tons for delivery inside of two months. While an advance in prices is not probable it is positively stated that there will be no cutting in rates for billets or bars. Crucible steel also is in demand and every plant of the Crucible Steel Co. of America is now in full operation, and it has a number of good contracts. The demand for wire products and steel pipe continues excellent. There have been two advances this year in each of these lines. Wire advanced $1 a ton on January 9 and $1 on March 5. Steel pipe, except sizes above 6 in., advanced $2 a ton on February 1 and another $2 on March 1.

One of the main features of the week was the heavy concessions made by the general executive board of the Amalgamated Association of Iron, Steel & Tin Workers on the sheet and tin-plate scales. The American Sheet & Tin Plate Co. had charged that independent concerns were deviating from the annual scale and claimed the advantages enjoyed by the others. Sufficient evidence of violations apparently was submitted to the board, as it was decided to make a revision in the scale of 1903-04. It provides for a cut of 20% in the sheet scale, or rather an additional reduction of 10%, a cut of 10% having been made on January 1. In the tin-plate scale a straight reduction of 20% was made and the base was lowered from $4.20 a box for standard coke plates to $3.50 a box. The present selling price, however, is less than the base, the price having been reduced several weeks ago from $3.60 to $3.45 a box. The settlement was made at a conference with the officers of the leading company which ended last Saturday night and went into effect yesterday. All the independent concerns were notified of the change. The board, owing to the emergency, assumed the authority to make the reduction, but stipulated that the agreement may be terminated on April 2. In the meantime the members in the sheet and tin-plate branches will be given an opportunity to vote on the matter. Voting sheets were sent out to-day and if the result is favorable the reduced rates will remain in force until the end of the scale year on June 30.

Pig Iron.—Sales of bessemer pig iron during the week aggregated about 10,000 tons at prices ranging from $13.35 to $13.50, Valley furnaces. The demand for foundry iron is improving and No. 2 is firm at $14, Pittsburg. Gray forge also is stronger and is quoted at $13.25, Pittsburg.

Steel.—Sheet-bars are decidedly scarce and firm at $24. Bessemer billets are in demand and it is impossible to do less than the pool price of $23. Steel bars are strong at 1.35c. and there is a probability that another advance of $1 a ton soon will be made. The plate market is improving and the price remains at 1.60c.

Sheets.—There has been a good demand, but prices have been very irregular. Some independent concerns that have had an advantage in the cost of production have been shading prices. The leading interest continues to quote black sheets, No. 28 gauge, at 2.30 c., and galvanized at 3.30c.

Ferro-manganese.—The market is improving and both foreign and domestic 80% is quoted at $43 per ton.

Cartagena, Spain. Mar. 5.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Shipments reported are two cargoes, 5,675 tons dry ore, to Great Britain. The market is much more active, and some large contracts for ore for future delivery are reported.

Current quotations for iron ore are: Ordinary 50% ore, 6s. 6d.@6s. 9d.; special low phosphorus, 7s.@7s. 6d.; specular ore, 58% iron, 9s.; magnetic ore, 60%, 11s. 3d. for lumps and 9s. 3d. for smalls. Manganiferous ores range from 14s. 3d. for 20% iron and 20% manganese down to 9s. 3d. for 35% iron and 12% manganese.

Pyrites.—Iron pyrites, 40% iron and 43% sulphur, are quoted at 10s. 3d. per ton.

CHEMICALS AND MINERALS.

New York, Mar. 23.

Spring opens with a slight improvement in trade, and with better transportation there is a more cheerful feeling prevalent. Raw materials continue high, but brimstone, being without special demand, is easier.

It is interesting to note that the United States Steel Corporation produced last year 15,407 tons copperas, and 644,286 bbl. cement, both showing a marked increase over 1902.

Electrolytic caustic potash, made at Niagara Falls, N. Y., has become a competitor of caustic soda for removing quickly the grease and dirt which generally settles on articles to be electroplated. It was recently claimed that a 20° Bé. solution of caustic soda was advantageously replaced by a 3° Bé. solution of caustic potash. This change shortened the time of cleaning, and consequently cheapened the cost of electroplating.

The foreign trade of Great Britain in the two months ending February 29, is shown below:

	Exports.	Imports.
Bleaching powder, lb.	15,418,704	4,589,872
Borax, lb.	.....	9,284,576
Brimstone, tons	.....	2,381
Cement, tons	42,174	38,199
Chemical manures, tons	58,320	.....
Copper sulphate, tons	13,115	.....
Nitrate of soda, tons	.....	13,991
Phosphates, tons	.....	84,441
Salt, tons	81,955	.....
Saltpeter, lb.	.....	4,231,808
Soda ash, lb.	26,782,560	
Soda, bicarb., lb.	5,028,576	
Soda, caustic, lb.	20,967,072	
Soda crystals, lb.	3,057,936	5,248,656
Soda, sulphate, lb.	16,420,096	
Soda, other sorts, lb.	6,006,112	
Sulphuric acid, lb.	2,505,552	.....

Compared with the corresponding period last year, imports show an increase generally, while exports mostly record a falling off.

Cyanide.—The domestic market continues quiet, but reports from Great Britain state that the exports to South Africa have been quite large, 175,000 lb. having been reported in one week recently. The improvement in demand in the Transvaal is due to an increased gold output. At New York importers quote 19@20c. per lb.

Bleaching Powder.—Aside from retail orders, trade is quiet. Contract prices continue at $1.25 per 100 lb., at New York, for prime British and American, and $1.20 for Continental. Of course off-test grades can be had at a discount. An interesting point, illustrating adherence to the agreement signed several months ago by first-hand sellers, is the gradual reduction in the exports to America by the British makers. In the two months ending February 29 Great Britain sent to this country 11,318,720 lb., whereas last year during the same period the shipments were 15,901,760 lb., or nearly 29% greater. Simultaneously the exports from the Continent to the United States have increased.

Copper Sulphate.—Competition is too small just now to offset the good effect of the heavier exports, and with rather light stocks on hand domestic makers hold to the quotation of $5.05@$5.10 per 100 lb., f. o. b. New York. Abroad the situation is likewise healthy, and the exports from Great Britain in February increased to 20,814,080 lb., making a total for the two months this year of 29,377,600 lb.—10% better than 1903. Better prices have also been received this year.

Acids.—Prices are firm, and deliveries on contract somewhat better than they have been of late. Minimum prices for oxalic acid are $5.10 per 100 lb. for German, $5.25 for British, and $5.50 for Norwegian.

We quote as below per 100 lb., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l.	$5.10@$5.50
Muriatic, 20°	1.60	Sulphuric, 50°, bulk, ton	13.50@14.50
Muriatic, 22°	1.75	Sulphuric, 60°	1.05
Nitric, 36°	4.50	bulk, ton	18.00@20.00
Nitric, 38°	4.75	Sulphuric, 66°	1.20
Nitric, 40°	5.00	bulk, ton	21.00@23.00
Nitric, 42°	5.50		

Brimstone.—Baiting the market with a 25c. cut on shipments apparently has little effect on consumers. Momentarily sellers ask $21.75@$22 per ton for future best unmixed seconds, but were they tempted with a good-sized order at less, the business would no doubt be closed. At present the margin between the price ruling in the primary market, plus ocean freight, permits of another 25c. cut in the New York quotation. Of course profits are so small nowadays that importers are really compelled to bargain pretty closely so as to come out ahead at the end of the year.

Sicilian Brimstone Market.—According to Messrs. Emil Fog & Sons, of Messina, in their circular for February 29, the war has caused a rise in foreign exchange, and the gold premium which had disappeared is visible again. In consequence quotations in sterling are 1s. lower, but this difference is compensated for by the increase in prices asked by the Anglo-Sicilian Co. Offerings of sulphur by dissidents are too small and irregular to influence the market. It appears certain that the syndicate's contract will not be renewed, although the Anglo-Sicilian Co. is disposed to do so, and is even willing to improve considerably the original conditions. The question agitating all who are interested is, what will become of the 300,000 to 400,000 tons sulphur stock at the close of the contract in June, 1906. Projects of all kinds are already being formed, mostly by people without capital, who aspire to a well paid situation in the new company. As some of these people possess political influence it is uncertain what attitude the Government will assume regarding the export duty abolished by special convention with the Anglo-Sicilian Co. The freight market has been upset by the war. Ship owners are holding back in hopes of realizing higher rates. Last ballast rate paid to New York, 6s. 9d.; today we quote 7s. Boston, 7s. 6d.; Philadelphia, 8s.; Canadian ports, 9s.; Baltic, 9@9s. 6d. Quotations, f.o.b, on sulphur are as follows, per long ton: Best unmixed seconds, bulk, 81s. 78s. 3d.; current thirds, 77s. 3d.; refined block, 3d., ground, in bags, 89s.; best thirds, bulk, 88s. 3d.@91s.; refined roll, bags, 94s. 3d.@99s. 9d., and sticks, 103s. 6d.@106s.; sublimed flowers, pure, 107s. 6d., current, 99s. 3d., and commercial, 93s. 9d.

Pyrites.—Regular customers are calling for moderate deliveries, while sellers' prices are unchanged. The new deposits at Pyriton, Ala., are to be developed energetically, as the Eastern Railroad from Talladega has been completed. This source of pyrites, it is believed, will further the interests of fertilizer manufacturers at Nashville, Tenn., since they already consume appreciable quantities of phosphates from Tennessee and need the sulphur.

Imports of pyrites from Spain and other countries into Great Britain in February and the two months this year and last, were as follows in long tons:

		Two months.	
	February.	1904.	1903.
Pyrites	53,985	140,824	125,897
Sulphur content	25,373	66,187	60,112

The increase this year is equivalent to 10%. At the same time the average f. o. b. price of pyrites has been reduced from about $8.29 per ton in February, 1903, to $7.78 in 1904. This, apparently, means a saving of over $1 per ton of sulphur. We quote domestic pyrites $5 per ton for lump ore f. o. b. Atlantic coast mines, and 9c. per unit for fines; sulphur content varies from 42@44%. Spanish pyrites, carrying from 46@52% sulphur, are quoted at 11@11.5c. per unit for lump, and 9.5@10c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—With consumption in America at the highest point on record, and with deliveries in Europe reported larger notwithstanding the abolition of the bounties on beet-sugar, the nitrate of soda market is in a particularly strong position. That prices are likely to continue high is evident from the advices received from Chile, which intimate a possible restriction in production owing to pending labor troubles. This recalls the repeated attempts of professional agitators, supported by unscrupulous politicians, to hoodwink the peons, who, by the way, are earning better wages and living than ever before. The method of these so-called unionists is to circulate among the laborers literature of a certain sort. When it is remembered that the industry, until quite recently, has yielded frequently little or no profit, and as the Chilean government receives about 70% of its revenue from the export duty on nitrate of soda, it would seem advisable to curb the influence of the labor agitators. Fortunately the higher selling prices in the last few years have permitted the officials to advance wages, but there ought also to be some consideration shown for the shareholders who have been carrying their stock for years at a discount.

Current quotations on spot nitrate of soda are $2.17½@$2.20 per 100 lb.; futures, $2.10@$2.15, according to position. Ocean freight rates continue to advance, and are already from 2s. 6d.@6s. 3d. (52c.@$1.50 per ton) higher than last year. Recent charters have been on the basis of 18s. 9d.@19s. ($4.50@$4.56) for early shipments, and up to 22s. 6d. ($5.40) for futures.

Chilean Nitrate of Soda Market.—Messrs. Jackson Bros., of Valparaiso, write under date of February 6 that transactions have been effected in 95% for February delivery at 6s. 10½d.@7s. 1¼d.; for March at 6s. 10d. @ 6s. 11½d.; May and August-October, 6s. 9d.; in 96%, for February and April deliveries, at 7s. 3d.@7s. 3½d.; July at 7s., August-December, 6s. 11d., all alongside terms. The exports for January are cabled as 2,570,500 qtls. We quote 95%; February, 7s. 1d.; March, 6s. 11d.; 96%, April-May, 7s. 3d., all ordinary terms sellers. The price of 7s. 1d., with an all round freight of 13s. 9d., stands in 8s. 7d. per cwt. net cost and freight, without purchasing commission. Reported sales for the fortnight ending February 6 were 514,500 qtl., and resales 144,000 qtl.

Sulphate of Ammonia.—Quiet. Good gas liquor is obtainable at $3.175@$3.20 per 100 lb.

Phosphates.—There are those who believe we shall se a mighty war waged between the two largest hard-rock miners in Florida. That this will be the final step towards control of the industry by one influential firm none will dispute. Still the market may be somewhat unsettled in the meantime, as it is learned that one of the combatants is about to reimburse his treasury. Consumers would do well to lay in their supplies of raw material at current prices, as it is difficult to say when the contending interests in Florida will settle their differences amicably. But will they sell? Apparently exporters will think hard before accepting large orders at present low prices. In conversation with a leading exporter recently it was learned that it pays better "to sit on the rock," even where producers are benefited by comparatively low freights over railroads in which they are interested. Henceforth the phrase "take orders at any price just to keep the mines busy" will be obliterated from the custom code of exporters, who recognize that the hard-rock deposits in Florida are rapidly becoming exhausted.

A remarkable feature of the phosphate industry is the enormous growth in consumption in recent years. In 1903 Europe alone purchased approximately 1,530,477 long tons crude phosphates from America, Africa and the Polynesian Islands, yielding something like 500,000 tons phosphoric acid. This phosphoric acid cost fertilizer manufacturers an average of

$23.09@$33.27 per ton, according to the grade of phosphate used.

The ocean freight rates are about as follows:

	Shipping ports.		
	Florida.	So. Carolina.	Algeria.
Baltic	$3.66@$3.74	$2.26	....
Continental	2.70@ 3.00	....	2.16@ 2.22
Mediterranean	3.36@ 3.60	....	1.80
United Kingdom	2.64@ 3.12	2.40@ 2.55	1.86@ 2 04

Prices for phosphates per ton are as follows:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla. hard rock, 77@80%	$6.50@ 7.00	$9.84@$10.83
land pebble, 68@73%	3.75@ 4.00	7.35@ 8.05
†Tenn, 78@80%	4.00@ 4.25	9.54@ 10.56
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
73@74%	2.95@ 3.20	.....
‡So. Car. land rock	3.25	.....
river rock, 55@60%	2.75@ 3.00	5.61@ 6.04
Algerian 63@70%	.....	6.82@ 7.32
58@63%	.....	6.05@ 6.50
53@58%	.....	4.95@ 5.09
Tunis (Gafsa)	.....	5.75@ 6.50
Christmas Isle, 80@85%	.....	11.75@ 12.54
Ocean Isle, 82@88%	.....	12.54@ 12.98
Somme, Fr., 70@75%	.....	10.91@ 11.05
Bordeaux, Fr., 60@65%	.....	7.80@ 7.92
55@60%	.....	6.60@ 6.72
Liege, Bel., 60@65%	.....	7.18@ 7.29

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

METAL MARKET.

New York, March 23.

Gold and Silver Exports and Imports,

At all United States Ports in February and Year.

Metal	February.		Year.	
	1903.	1904.	1903.	1904.
Gold:				
Exports.	$1,506,370	$732,614	$1,592,321	$1,324,181
Imports.	1,817,456	5,030,372	3,828,307	13,255,880
Excess	I. $311,086	I. $4,297,758	I. $2,235,986	I. $11,931,699
Silver:				
Exports.	3,886,514	3,801,869	7,444,395	8,419,996
Imports.	1,687,007	2,110,675	3,181,563	4,720,047
Excess	E. $2,179,507	E. $1,691,194	E. $4,262,832	E. $3,699,949

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending March 19 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$507,000	$52,764	$615,160	$1,632
1904	1,911,660	1,508,039	11,290,890	171,775
1903	1,252,551	2,080,830	4,325,595	278,780
1902	13,800,727	787,083	8,744,339	303,168

The silver exported went chiefly to London; shipments this year have been on a large scale.

Business generally is rather quiet, and is lagging on some lines. There has been a somewhat better turn in the speculative markets. There have been some further shipments of gold to the Argentine Republic, making the total sent over $3,000,000.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending March 19, gives the following totals, comparison being made with the corresponding week of 1903:

	1903.	1904.
Loans and discounts	$911,547,400	$998,918,800
Deposits	900,682,400	1,037,013,700
Circulation	42,863,500	36,913,800
Specie	163,592,500	217,239,600
Legal tenders	64,758,500	69,324,400
Total reserve	$228,351,000	$286,564,000
Legal requirements	225,170,600	259,253,425
Balance surplus	$3,180,400	$27,310,575

Changes for the week, this year, were an increase of $1,519,800 in loans and discounts, and decreases of $255,200 in deposits, $1,048,800 in circulation, $1,896,500 in specie, $794,800 in legal tenders, and $2,626,500 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

	1903. Gold.	1903. Silver.	1904. Gold.	1904. Silver.
N. Y. Ass'd	$163,592,500	.....	$217,239,600	.....
England	185,680,205	.....	178,366,365	.....
France	505,257,760	$219,704,700	467,783,140	$221,811,140
Germany	173,475,000	60,950,000	177,545,000	61,705,000
Spain	72,240,000	99,660,000	73,120,000	97,280,000
Netherlands	20,537,000	32,935,000	27,205,500	33,196,000
Belgium	15,793,335	7,896,665	15,653,335	7,826,665
Italy	87,630,000	10,916,000	109,620,000	18,934,000
Russia	394,740,000	41,135,000	456,385,000	40,630,000
Austria	230,815,000	64,480,000	235,630,000	63,640,000

The returns of the Associated Banks of New York are of date of March 19, and the others March 17, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has shown a declining tendency owing to the dulness of the Eastern demand, and the absence of outside orders. There are no new features in the situation.

The United States Assay Office in New York reports receipts of 94,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to March 10 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.	Changes.
India	£1,668,900	£2,921,539	I. £1,252,639
China	106,500	71,000	D. 35,500
Straits	128,491	58,103	D. 70,388
Total	£1,903,891	£3,050,642	I. £1,146,751

Receipts for the week were £190,000 in bar silver from New York, and £5,000 from Australia, total, £195,000. Shipments were £182,500 in bar silver, and £25,000 in Mexican dollars to Bombay; total, £220,000.

Indian exchange continues steady, the Council bills offered in London being taken at an average of 16.06d. per rupee. The buying of silver for Indian account continues, but on rather a moderate scale.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.44	$0.47½
Peruvian soles and Chinese pesos	.40½	.45
Victoria sovereigns	4.85½	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

March	Silver—New York, Cts.	Silver—London, Pence.	Copper—Lake, Cts. per lb.	Copper—Electrolytic, Cts. per lb.	Copper—London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter—N. Y., Cts. per lb.	Spelter—St. Louis, Cts. per lb.
17	56⅝	26⅛	12⅜ @12⅝	12⅛ @12⅜	57¼	28¼	4.45 @4 50	5.00	4.80
18	56¾	26 7/16	12⅜ @12⅝	12⅛ @12⅜	57⅜	28⅝	4.45 @4.50	5.00	4.80
19	57	26¼	12⅜ @12⅝	12⅛ @12⅜	....	28½	4.45 @4.50	5.00	4.80
21	56⅜	26	12⅛ @12¾	12¼ @12½	57½	28⅝	4.45 @4.50	5.00	4.80
22	56⅜	26	12⅝ @12⅞	12⅜ @12⅝	58½	28¾	4.45 @4.50	5.00 @5.05	4.80 @4.85
23	55⅞	25¾	12¾ @ 13	12½ @12⅝	58	28⅞ @29	4.45 @4 50	5.00 @5.05	4.80 @4.85

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures

QUOTATIONS ON STERLING EXCHANGE.

March	17	4.86¾	March	21	4.86¾
"	18	4.86¾	"	22	4.87
"	19	4.86¾	"	23	4.87

Copper.—During the week under review the market has developed considerable strength. While for some weeks most of the business done was for export, home consumers have now also entered the market, buying freely for spot as well as future delivery. Inasmuch as most of the manufacturers had allowed their stocks to become depleted, a further good demand is looked for, as trade in general, especially in electrical lines, is reported to be more satisfactory. The recent statement of the president of a large railroad to the effect that at least as far as his system is concerned, he expects inside of some years, locomotives will be looked upon as a curiosity, certainly augurs well for the use of copper in the transmission of power for long-distance travel.

The closing quotations are given as 12¾@13c. for lake; 12½@12⅝c. for electrolytic in cakes, wire-bars or ingots; 12¼@12⅜c. for cathodes, and 12⅛@12⅜ for casting copper.

The market for standard copper in London, which last week closed at £57 7s. 6d. opened on Monday at £57 10s., and the closing quotations on Wednesday are cabled as £58@£58 1s. 3d. for spot and £57 12s. 6d.@£57 13s. 9d. for three months' prompt.

For refined and manufactured sorts, we quote: English tough, £60 10s.@£61; best selected, £61@£61 10s.; strong sheets, £71@£71 10s.; India sheets, £69@£69 10s.; yellow metal, 6¼@6⅜d.

Exports from Atlantic ports for the week ending March 22 were 4,052 tons copper and 45 tons matte, principally to Great Britain and Germany. Imports were 110 tons copper from Mexico, and 1,817 tons ore from Cuba.

Imports and exports of copper in Great Britain for the two months ending February 29 were as follows, in long tons; the totals showing fine copper contained in all material:

	1903.	1904.	Changes.
Copper ore	16,948	13,133	D. 3,815
Matte and precipitate	10,668	8,274	D. 2,394
Fine copper	8,155	16,553	I. 8,398
Totals, fine copper	15,184	22,003	I. 6,819
Exports	9,043	8,500	D. 543
Balance	6,141	13,503	I. 7,362

Of the imports this year 3 tons of ore, 1,132 tons of matte and 9,153 tons of fine copper were from the United States; against 88 tons ore, 876 tons matte and 2,244 tons fine copper last year.

Tin.—The market has had an upward tendency throughout the week and a fair business has been done for early delivery. Futures are still rather neglected. The closing quotations are given as 28⅞@29c. for spot and 28⅜@28½c. for futures.

The foreign market, which last week closed at £128 15s., opened on Monday at £129, on Tuesday advanced to $130, and the closing quotations on Wednesday are cabled as £130 2s. 6d. @£130 3s. 9d. for spot and £130@£130 1s. 3d. for three months' prompt.

Imports of tin into Great Britain, with reexports of imported tin, for the two months ending February 29, were as follows, in long tons:

	1903.	1904.	Changes.
Straits	3,223	3,575	I. 352
Australia	736	587	D. 149
Other countries	414	616	I. 202
Total	4,373	4,778	I. 405
Re-exports	3,771	3,638	D. 133
Net imports	602	1,140	I. 538

The tin from other countries was chiefly Bolivian tin. The larger part of the re-exports went to the United States.

The official report of tin production in the Federated Malay States for the full year is as follows, the figures being in pikuls, of 133.6 lb. each:

	1902.	1903.	Changes.
Tin	335,603	345,489	I. 9,886
Tin ore	445,269	494,319	I. 49,050
Total	780,872	839,808	I. 58,936

The Federated States include Perak, Selangor, Negri-Sembilang and Pahang. The total duty levied on the output last year was $9,593,270 in silver.

Lead is quiet but steady, without any special feature. The closing quotations are given as 4.45@4.50 New York and 4.37½@4.42½ St. Louis.

The foreign market is very firm, Spanish lead being quoted £12 5s.@£12 6s. 3d. and English £12 17s. 6d.@£12 18s. 9d.

Imports and exports of lead in Great Britain for the two months ending February 29 were as follows, in long tons:

	1903.	1904.	Changes.
United States	5,419	4,614	D. 805
Spain	15,261	16,735	I. 1,474
Australia	11,507	12,432	I. 925
Other countries	2,976	3,151	I. 175
Total imports	35,163	36,932	I. 1,769
Exports	4,186	6,360	I. 2,174
Balance	30,977	30,572	D. 405

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 5, that the price of silver during the week has been 14.75 reales per oz. Exchange is 34.90 pesetas to £1. Local quotation for pig lead has been 67 reales per quintal, which, on current exchange, is equal to £10 14s. 10d. per long ton, f. o. b. Cartagena. Shipments were 305,506 kg. pig lead and 450,000 kg. desilverized lead to Newcastle; 212,172 kg. pig lead and 608 kg. bar silver to Marseilles.

Spelter.—In view of the higher ore market and a good demand for both galvanizing and brass purposes, the market is again somewhat firmer and we understand a large business has been done. The closing quotations are given as 4.80@4.85 St. Louis and 5@5.05c. New York.

The foreign market is firm, good ordinaries being quoted £21 17s. 6d. and specials £22 2s. 6d.

Imports and exports of spelter in Great Britain for the two months ending February 29 were as follows, in long tons:

	1903.	1904.	Changes.
Spelter	14,360	13,593	D. 767
Zinc sheets, etc.	3,607	3,376	D. 231
Total	17,967	16,969	D. 998
Exports	1,526	1,124	D. 402
Balance	16,441	15,845	D. 596

The imports this year show a slight decrease, while the exports also fell off. Imports of zinc ores are not reported.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 5, that prices are firmer, while several contracts are reported, running well into the year. Shipments were 1,840 tons blende and 2,800 tons calamine to Antwerp; 10 tons blende and 17 tons calamine to Liverpool.

Antimony is dull. The ruling quotations are 7¾@8c. for Cookson's; 6⅞@6⅞ for Hallett's; 6⅜@6½c. for U. S., Italian, French, Hungarian, Japanese and Chinese.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Demand continues steady, and the price is firm at $18.50 per oz.

Messrs. Eimer & Amend, of New York, quote prices for platinum in manufactured forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 75c. per gram; platinum crucibles and dishes, 77c. per gram; perforated wire, like cones, Gooch crucibles, etc., 82c. per gram.

Quicksilver.—The New York price is $45.50 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders, and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Imports of quicksilver into Great Britain, with re-exports of imported metal, for the two months ending February 29, were as follows, in pounds:

	1903.	1904.	Changes.
Imports	804,168	63,850	D. 740,318
Re-exports	360,780	341,058	D. 19,722
Balance	I. 443,388	E. 277,208	.....

The stocks carried were reduced this year by 277,208 lb. Imports were unusually light.

Cadmium.—According to Herr Paul Speier, metallic cadmium is in good demand. Metal containing 99.5% cadmium sells at 700 marks per 100 kg., delivered in Berlin or Hamburg.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Aluminum	Per lb
No. 1, 99% ingots	33@37c.
No. 2, 90% ingots	31@34c.
Rolled Sheets	4c. up
Alum-bronze	20@23c.
Nickel-alum	34@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybde'm (50%)	$1.25
Ferro-Titanium (10%)	90c.
Ferro-Titanium (20@25%) N. Y.	55c.

	Per lb
Ferro-Tungsten (37½)	38c.
Magnesium, pure (N. Y.)	60c.
Manganese	$2.75
Mangan'e Cop. (20% Mn.)	32c.
Mangan'e Cop. (30% Mn)	38c.
Molybdenum (Best)	$2.00
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Sodium metal	50c
Tungsten (Best)	88c.

Variations in price depend chiefly on size of order.

Missouri Ore Market. Mar. 19.

(From Our Special Correspondent.)

The highest price paid for zinc ore was $40 per ton, an advance of 50c. per ton over the previous week. Two lots of extra grade ore brought this price. The assay basis price is as variable to-day as the old form of direct bidding was ever known to be. One lot of 60% zinc sold at $36.50 per ton on what is termed a straight bid, without deductions for moisture, and one lot of 58% zinc is known to have sold at $36 per ton without deductions. One firm sold zinc ore from four different mines, varying in assay from 58% to 63% zinc, all at $38.50 per ton. These were all straight bids. Where ore was sold strictly on an assay basis nothing above $36 per ton of 60% zinc was reported, and some ore sold as low as a basis of $33 per ton of 60% zinc. One lot of ore assaying 58% zinc sold at $19.40 per ton, on a basis of $35.50, owing to the quantity of iron contents. It will be seen that choice ore commands a price out of proportion to the alleged assay basis, owing to the acute situation existing now, with the reserve stock reduced to small and scattering bins of less desirable ore, and the demand greater than the output. So acute has become the situation that purchasing agents are contracting the most desirable ore before it is mined, fully a third of next week's output being now engaged. When zinc ore is plentiful, the purchasing agents assert that it is expecting too much for producers to hope to receive for their ore a relative price of seven-to-one, but this is not heard now, though the price is proportionately greater. With spelter 4.85c., St. Louis, zinc ore, on the seven-to-one schedule advocated a few years ago by the Missouri & Kansas Zinc Miners' Association, would now be only $34 per ton of 60% zinc.

Local competition for lead ore has advanced that product as much out of proportion to the metal market as has the demand for zinc affected that ore. Four smelters have buyers in the field, and while the general quotation is given at $58 per ton, it is known that choice ore is selling at $59, $59.50 and even $60 per ton. On the old method of figuring these prices leave only $2.30 to $4.30 per ton for smelting, while the former smelting charge was always based on $7 per ton.

Following are the shipments of zinc and lead from the camps of the Joplin district reporting for the week:

	Zinc. lb.	Lead, lb.	Value.
Joplin	2,910,470	291,650	$61,020
Webb City-Carterville.	2,206,230	407,590	47,120
Duenweg	1,320,500	126,490	27,440
Galena Empire	864,260	152,470	18,250
Alba-Neck	681,770	.....	11,930
Carthage	512,400	.....	9,225
Aurora	525,950	12,840	8,960
Prosperity	152,960	202,490	8,750
Badger	298,210	9,430	5,640
Granby	370,000	30,000	3,680
Carl Junction	134,670	7,960	2,790
Oronogo	150,900	8,310	2,780
Central City	135,230	9,620	2,310
Reeds	94,360	.....	1,600
Beef Branch	26,820	54,610	1,440
Spurgeon-Spring City.	96,760	14,780	1,195
McDowell	62,200	.....	1,055
Stotts City	49,500	.....	840
Totals	10,593,190	1,328,240	$216,025
Twelve weeks	120,896,090	15,104,390	$2,422,395

The week's shipment was a decrease of 450 tons of zinc and 47 tons of lead, principally from lack of cars for loading the ore purchased. The shipment was larger than a year ago—163 tons of zinc and 212 tons of lead. At that time zinc was $41 and lead $58.50 per ton. Shipment for 12 weeks of this year has been 7,463 tons of zinc and 1,517 tons of lead greater than the same period of last year.

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903	1904.	1903.	1904.	1903.	1904.
Jan...	28.33	28.845	4.075	4.347	4.865	4.863
Feb..	29.43	29.087	4.075	4.375	5.043	4.916
Mar..	30.15	.....	4.442	.....	5.349	....
April.	29.81	.....	4.567	.....	5.550	....
May..	23.51	.....	4.325	.....	5.639	....
June.	28.34	.....	4.210	.....	5.697	....
July..	27.68	.....	4.075	.....	5.662	....
Aug..	28.29	.....	4.075	.....	5.725	....
Sept..	26.77	.....	4.243	.....	5.686	....
Oct...	25.92	.....	4.375	.....	5.510	....
Nov..	25.42	.....	4.218	.....	5.338	....
Dec...	27.41	.....	4.162	.....	4.731	....
Year	28.09	.....	4.237	.....	5.400	....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.; February, 4.717c.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan...	12.159	12.410	12.361	12.553	53.52	57.55
Feb...	12.778	12.063	12.901	12.245	57.34	56.57
Mar..	14.416	.....	14.572	.....	63.85	.....
April.	14.454	.....	14.642	.....	61.72	.....
May..	14.435	.....	14.618	.....	61.73	.....
June.	13.942	.....	14.212	.....	57.30	.....
July..	13.094	.....	13.341	.....	56.64	.....
Aug..	12.962	.....	13.159	.....	58.44	.....
Sept..	13.205	.....	13.345	.....	56.82	.....
Oct...	12.801	.....	12.954	.....	55 60	.....
Nov..	12.617	.....	12.813	.....	56.30	.....
Dec..	11.952	.....	12,084	.....	56.36	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London. Pence.	N. Y., Cents.	London Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan..	25.62	55.56	21.98	45.57	26 423	57.055
Feb..	25.41	55.09	22.11	47.89	26.665	57.592
Mar..	25.00	54.23	22.49	48.72	.....	.....
April.	24.34	52.72	23.38	50.56	.....	.....
May..	23.71	51.31	24.89	54.11	.....	.....
June.	24.17	52.36	24.29	52.86	.....	.....
July..	24.38	52.88	24.86	53.92	.....	.....
Aug..	24.23	52.52	25.63	55.36	.....	.....
Sept..	23.88	51.52	26.75	58.00	.....	.....
Oct...	23.40	50.57	27.89	60.36	.....	.....
Nov..	22.70	49.07	27.01	58.11	.....	.....
Dec...	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.45	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce. .925 fine.

DIVIDENDS.

Company.	Payable.	Latest Dividend. Rate.	Total.	Total to date.
†Alaska Treadwell	Apr. 28	.75	$150,000	$5,645,000
Alaska Tr'dwell, ex.	Apr. 28	.37½	75,000	.....
†Am. S. & R., com.	Apr. 20	1.25	625,000	1,250,000
†Am. S. & R., pf.	Apr. 5	1.75	875,000	14,141,533
†Cent. C. & C., com.	Apr. 15	1.50	76,875	705,000
†Central C. & C., pf.	Apr. 15	1.25	23,437	843,746
†General Chem. pf.	Apr. 1	1.50	150,000	2,875,178
†Guggenheim Expl.	Apr. 5	1.75	183,750	918,750
†Iron Silver, Colo.	Apr. 1	.10	50,000	2,950,000
New Idria Q., Cal.	Apr. 1	.30	30,000	610,000
Oil City Pet., Cal.	Apr. 1	.00½	2,500	2,500
‡Penna. Salt	Apr. 15	3.00	180,000	13,630,000
†Tenn. C. & I., pf.	May 2	2.00	4,960	317,024
‡U. S. Steel, com.	Apr. 15	3.00	123,600	638,600
‡U. S. Steel, pf.	Apr. 15	2.00	20,600	247,200
†Va.-Car. Chem., pf.	Apr. 15	2.00	240,000	7,500,869
‡Wolverine Copper	Apr. 1	3.50	210,000	1,530,000

• Monthly. † Quarterly. ‡ Semi-annually.

ASSESSMENTS.

Company.	Delinquent.	Sale.	Amount.
Belcher, Nev.	Apr. 13	May 5	$0.10
Belmont, Utah	Apr. 7	.....	¢10
Brunswick Con., Cal.	Apr. 5	.....	.03
Chollar, Nev.	Apr. 12	.....	.10
Con. Imperial, Nev.	Apr. 14	.....	.01
Exchequer, Nev.	Apr. 11	May 2	.05
Jubilee, Cal.	Apr. 18	.....	.05
Julia Con., Nev.	Apr. 13	May 3	.03
Overman, Nev.	Apr. 12	.....	.10
Star Con., Utah	Apr. 4	.....	.01
St. George Copper, Utah.	Apr. 5	.....	.01
Union Con., Nev.	Apr. 19	.....	.15
White Pine Copper, Nev.	Apr. 16	.....	.05

STOCK QUOTATIONS

NEW YORK

Company.	Par val.	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Mar. 19 H.	Mar. 19 L.	Mar. 21 H.	Mar. 21 L.	Mar. 22 H.	Mar. 22 L.	Sales
Acacia	$1													
Amalgamated, c.	100	47¼	46½	47⅛	46⅝	48⅝	46⅞	48¾	47⅜	49¼	47¾	48¼	47⅜	211,540
Anaconda, c.	25	64¼	....	66	65	66⅛	..	67¾	67⅛	67	....	66	65¾	1,800
Anaconda, g.	5					15	....							1,000
Belcher, s.	3													
Best & Belcher, s.	3													
Brunswick, g.	5													
Bullion, s.	1	12	11											300
Caledonia, s.	1			1.20	1.15	1.20								300
Challenge, s.	2½													
Chollar, s., g.	2½			21	20	30	29					22		1,100
Confidence	3	1.10												200
Con.Cal.&Va., g.s.	2½	1.70										1.85		700
Con. Imperial, s.	1			01										200
Cripple Creek, g.	1													
Crown Point	2½									20				200
C. K. & N., g.	1									18				500
Daly, g. s.	20	2.25												50
Dunkin, s.	1													
Elkton, g.	1					65		65	64	67		66		1,600
Gold Dollar, g.	1													
Gould & Curry	1	46	45											600
Greene Con., c.	10	10¼	....	10⅝	10¼	10¼	10⅜	10⅝	10¼	11	10¾	11⅜	11	7,130
Homestake, g.	100													
Horn Silver	20	1.30	....	1.30	....	1.25	....	....	....	....	....	1.25	....	†1,300
Isabella, g.	1	28						28						2,000
Jack Pot, g.	1													
Julia, s.	1													
Justice, s.	2			08	07			08						1,200
Little Chief, g. s.	50													
Mexican, s.	3					2.20	2.15			1.90				400
Mollie Gibson, g.	5					05								500
Moon Anchor, q.	5					11								200
Moulton, g.	25							20						100
Occidental, s.	3													
Old Gold, g.	1					09								500
Ontario, s. l.	100					4.25		4.25						60
Ophir, s.	3	5.60						5.00	4.50					250
Overman, s.	2							24						200
Pharmacist, g.	1													
Phœnix, g.	1	09	....	09	....			03						1,300
Portland, g.	1					1.85						1.85		200
Potosi, s.	1			26		28						26		1,400
Quicksilver, Pf.	100							5.50						30
Savage, s.	3	80				74		62		63	61	1.65		1,700
Sierra Nevada, s.	3			70						65				400
Small Hopes														
StandardCon.,g.s.	16	2.60						2.60						200
Tennessee, c.	25													
Union Con., g. s.	1											86	85	800
Union Copper	10					5⅝				5⅝				500
United, com., c.	100	6⅜						5¾		6		6		608
Utah, s.	1	20		20										400
White Knob, c.	10	8¼		8⅜	8					8⅛				500
Work, g.	1													
Yellow Jacket, s.	3					32				31				100

c—Copper. g—Gold. l—Lead. s—Silver. Total sales, 241,868 shares. † Ex-dividend.

BOSTON, MASS.

Company.	Par val	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Mar. 19 H.	Mar. 19 L.	Mar. 21 H.	Mar. 21 L.	Mar. 22 H.	Mar. 22 L.	Sales.
AdventureCon.,c	$25	2⅛	....	2⅛	....	....	....	2¼	2⅛	2¼	2⅛	2¼	....	430
Aetna q.														
Allouez, c.	25	3¾								3⅜	3⅝	3⅞		200
Amalgamated, c.	100	47⅛	46¼	47¼	46⅜	48⅜	47	48⅝	47½	49½	47¾	48¼	47⅜	29,896
Am. Gold Dredg.	5									75				100
Am. Z., L. & Sm.	25					8				10	8	9⅜	9¼	975
Anaconda, c. s.	25			16¼	..	16¼								203
Arcadian, c.	25									45				50
Arnold, c.	25													
Atlantic, c.	25	8⅛	8			8		7½		8	7⅞			140
Bingham Con.	50	19⅝	19⅛	19⅝	19⅝	..	....	20¼	19¾	20⅛	20	20	19⅝	1,043
Bonanza Dev. g.	10	45										47½		150
British Col., c.	5													
Calumet & Hecla	25	449	....	446	....	449	447			450	447	447		32
Centennial, c.	25	17	16⅞	17						17⅜	17	17½	17	910
Central Oil	25											7⅛	7¼	30
Con. Mercur, g.	5	60		60		60				60				600
Copper Range	100	41½	40⅝	41½	40⅝	41⅞	40⅝	41¾	41	42⅜	41⅜	42	41⅛	8,574
Daly West, g. s. l	20	31	30½	30¾	30	30¼	..	30½	30	30⅛	27½	27	24¾	4,932
†Dominion Coal	100	56½	55	56	....	58¼	58	59⅛	59	61	60	59	....	1,2 0
Preferred	100	109				110								11
Dominion I. & S.	100	8⅛	8⅛	8¾	8⅛	8⅛	....					8⅝	8⅝	875
Elm River, c.	12									2¼				100
Franklin, c.	25	7⅛		8		8						7		27
Granby Con.	10	3⅜	3¼	3¼	3⅛	3	2⅝	2 1/16	2⅜	2¼		3	2¾	4,630
Guanajuato Con.	5	1.12½	95			1¼	1			1½	1⅜	1¼		6,205
Isle Royal Con.	25									7⅝	7½			10
Mass Con., c.	25	3¼	3 1/16			3⅛		3½	3⅛	3¼		3½		530
Mayflower, c.	25													
Michigan, c.	25	4¾		4½						4½		4¾		355
Mohawk, c.	25	35¼	35⅛	35⅛	35¼	35⅝	35			36½	35½	36⅝	36	2,196
Mont. Coal & C.	25													
Mont'l & Boston.	5													
New Idria, q.	5													
Nova Scotia St.	100													
Preferred	100													
Old Colony, c.	25									1				5
Old Dominion, c.	25							9½		10	9⅝			380
Osceola, c.	25	57	56⅜	57	56½	57	56½			57¼		57	56	293
Parrot, s. c.	10					22¾				23		23	22½	331
Phœnix Con, c.	*25			1 1/16										100
Quincy, c.	25	83		84½	83			84		84				48
Rhode Island, c.	25											85		50
Santa Fe, g. c.	10					1¾	1⅝							225
Shannon, c.	10	7¼	7⅛	7⅝	7⅛			7¾	7 7/16	7¼		7¾		2,430
Tamarack, c.	25			94½	90	94								43
Tecumseh, c.	25													
Tennessee, c.	25													
Trinity, c.	25	4¾				4⅝	4½	4⅝		4¾		4⅝	4½	550
United c.	100							6						100
United States, g.	10	21⅜	20¾	21⅜	21	21¼	21	21⅜	21	21⅝	21¼	21¼		5,250
U. S. Coal & Oil.	25			8¾	8⅝			9		9½	9⅛			610
Utah Con., g. c.	5	34⅜	33⅛	34¼	33⅞	34	33¾	33¼	33⅝	34½	34	34	7	3,570
Victoria, c.						3 1/16								110
Winona, c.	25			5¾		5 1/16		5¾	5¼	5⅝	5½			310
Wolverine, c.	25	74¼	70¾	70¾	70	70⅝		70½		70½		71		70
Wyandot, c.	25									52		60		100

*Holiday. †Ex-dividend. ‡Assessment Paid. Total sales, 78,216 shares.
c—Copper g—Gold. l—Lead. q—Quicksilver. s—Silver.

Duluth, Minn.

Company	Par Val.	Bid.	Asked.	Company	Par Val.	Bid.	Asked.
Calumet & Arizona	$10	$110	$111	Lake Sup. & Pitts Dev.	$10	$130	$135
Calumet & Bisbee	10	7.50	8.00	Pitts. & Duluth Dev.	15	50.00	51.00
Calumet & Cochise	10	7.50	8.00	Shakespeare			.20
Calumet & Pittsburg	10	33.50	35.00	United Mexican			.50
Higgins Development	10	3.00		Wolverine & Arizona	10	4.60	
Junction Development	15	14.00	14.50	Yaqui	10		1.50

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Mar. 19 H.	Mar. 19 L.	Mar. 21 H.	Mar. 21 L.	Mar. 22 H.	Mar. 22 L.	Sales
Allis-Chalmers	$100	12	....	....	....	....	....	8	....	8	7⅛	6⅝	6	1,030
Preferred	100	....	....	....	....	....	....	....	....	48	....	45	39¾	500
Am. Agr. Chem	100	13	....	....	....	13¼	13	13½	....	....	....	....	....	700
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Am. Sm. & Ref.	100	48¼	47¾	49	48⅛	49	47¾	48⅜	48¼	49⅜	48⅛	48⅞	48¾	10,225
Preferred	100	92	91	92	91¾	92⅛	92⅛	92	....	92⅛	91⅞	92¾	92	4,928
Col. Fuel & I.	100	29½	29	29⅜	28⅞	28⅝	28⅛	....	....	29⅜	28⅜	....	....	2,570
Preferred	10													
Col. & H. C. & I.	100	12⅜	....	....	....	12¼	....	13⅜	....	13⅛	13¼	13⅛	13	970
*Crucible Steel	100	4¾	4	5⅛	5	5¼	4⅜	5	4⅜	5⅛	5	5⅛	5	5,180
*Preferred	100	29⅞	29¼	31	30	32½	31	31	....	32⅛	31	31	....	2,150
General Chem.	100													
Preferred	100			96										100
*Mong. R. Coal	50			9								9	8⅝	115
*Preferred	100	24½	....	25¾	24¾	26	....	25¾	25	....	....	....	....	1,559
National Lead	100	15	....	14⅞	14¾	14⅞	14⅝	14¾	....	15	....	15	....	1,100
Preferred	100	....	....	....	....	....	....	84½	....	....	....	....	....	130
*Phila. Nat. Gas.	100	....	....	39	....	39⅝	....	....	....	....	....	40⅛	....	375
*Preferred	100													
*Pittsburg Coal	100	16⅝	16	16¾	16⅝	17	16	16	....	15⅜	....	....	....	2,505
*Preferred	100	56	54½	57	56	59	58	59	58¼	59	....	59	58	3,464
Republic I. & S.	100	7⅝	7½	7⅞	7½	8	....					7½	....	2,670
Preferred	100	....	....	44	....	43½	42½	44	....	44	....	44¼	....	1,025
Sloss-Shef S. & I.	100	39¾	38½	39¼	....	39½	36⅝	37	....	39½	39⅜	39¾	39	1,300
Preferred	100	80	....	82	....	82	81½	....	....	....	....	81¼	80½	1,040
‡Standard Oil	100	620		324	319½	623¾	....	....	....	*25	624	625	620	173
Tenn. C.I. & R.R.	100	39½	38	39¼	37¾	39	37¾	38	....	39⅝	38¼	39¾	38½	13,295
U.S. Red. & Ref.	100													
Preferred	100													
U.S.Steel Corp.	100	11⅜	11⅛	11⅜	11⅛	11⅜	11⅛	11⅜	11⅛	11⅜	11	11⅛	11	66,302
Preferred	100	57⅜	56⅜	58⅜	56⅞	58¾	57⅝	58⅜	57⅞	58⅛	57¼	57⅝	56⅞	274,471
Va.-Car Chem.	100	30½	30	30⅜	30¼	....	....	....	....	30½	30	31	30½	3,370
Preferred	100	102¾										104	....	165

*Pittsburg exchanges. †Holiday. ‡Ex. dividend. Total sales, 401,382.

COLORADO SPRINGS, COLO.

Company.	Par Val	Mar.12 H.	Mar.12 L.	Mar. 14 H.	Mar. 14 L.	Mar. 15 H.	Mar. 15 L.	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Sales
Acacia	$1	.06½	.04	.08	.06	.06½	.06	.06½	.06¼	.06½	.06¼	.06½	.06¼	.....
American Con.	1													
Anaconda	5	.15	....	.15	.13	.15	....	.15	....	.13	.12¼	.13	.12	1,000
Colo. City & M.	1	.33	.12½	.02⅞	.02⅛	.02⅞	.02½	.02½	....	.02⅜	.02⅛	.02⅞	.02⅝	.....
C. K. & N.	1	.20	.19	.20	.19	.20	.19	.20	.19	.20	.19	.20	.19	.....
Cripple Ck. Con.	1	.07	.06¾	.06¾	.06¾	.06⅝	.06⅝	.06¾	.06⅝	.06¾	.06⅝	.06¾	.06⅝	6,000
Des Moines	1	.03½	.02	.02½	.02	.02½	.02	.02½	.02	.02½	.02	.02½	.02	.....
Doctor Jack Pot	1	.09¼	.07½	.08	.07⅞	.08	.07	.08	.07½	.07¾	.07	.07¾	.06	3,000
Elkton Con.	1	.65	.63½	.64	.63¼	.63	.62½	.63	.60	.63¼	.62¾	.64	.63	8,900
El Paso	1	.73½	.72½	.72½	.72	.73¼	.72	.74	.73	.74	.73½	.75	.74¾	9,200
Gold Dollar Con.	1	.05¼	.05⅛	.05⅛	....	.05½	.05⅛	.05¼	.05⅛	.05¼	.05	.05⅜	.05¼	12,000
Gold Sovereign	1	.04¾	.04	.04¼	.03⅞	.04¼	.04	.04¼	.04	.04¾	.01½	.04¼	.04¼	17,000
Golden Cycle	1	.51	.49	.51	.49	.51	.49	.43	.47	.50	....	.49¼	.40⅜	500
Golden Fleece	1	.02	....	.02	....	.02	....	.02	....	.02	....	.02	....	.....
Hart	1	.02½	....	.02	....	.02	....	.02	....	.02	....	.02	....	.....
Isabella new	1	.33	.30	.32	.29	.32	.28	.30	.27¾	.28½	.25	.28	.26½	5,600
Jack Pot	1							.09	....	.09	....	.09	....	.....
Keystone	1	.04	.03¾	.04¼	.04¾	.04	.03⅞	.04	.03¾	.04¼	.03⅞	.04¼	.03⅝	1,600
Last Dollar	1	.45	....	.45	....	.45	....	.45	....	.45	....	.45	....	.....
Lexington	1	.04¼	.04	.04¼	.04	.04½	.04	.04¼	.03¾	.04¼	.04⅛	.04⅜	.04⅛	3,000
Little Puck	1	.02⅞	.02½	.02¾	.02¾	.03½	.03	.04	.03½	.03½	.03⅜	.03⅝	.03⅜	28,000
Mollie Gibson	1	.07	....	.07	....	.07	.04	.06½	.04¾	.05¾	.04½	.06⅜	....	1,000
Moon-Anchor	5	.10	....	.11	.08	.10	.08	.10	.08	.10	.08	.09⅜	.08½	
New Haven	5	.02⅝	.02½	.02⅝	.02⅜	.02⅝	.02⅜	.02⅝	.02⅜	.02⅝	.02⅜	.02⅝	.02¼	8,000
Old Gold	1	.09⅜	.09	.09⅜	.09	.09⅜	.09	.09⅜	.09	.09⅜	.09	.09½	.09	
Pharmacist	1	.04½	.04	.04¾	.04	.04	.04	.04¾	.03¾	.04	.03⅝	.04	.03¾	2,000
Pinnacle	1	.04		.04½		.04½		.04		.03½		.08		
Portland	1	1.80	1.70	1.80	1.75	1.80	1.70	1.79	1.70	1.80	1.70	1.80	1.65	100
Vindicator Con.	1	.61	.60	.66	.60	.66	.60	.66	.60	.66	.60	.67	.60	2,300
Work	1	.06½	.06¼	.06⅜	.06⅛	.06½	.06	.06⅜	.06	.06¾	.06	.06¾	.06⅜	1,500

Total sales, 109,500 shares.

COLORADO SPRINGS (By Telegraph).

Company.	Mar. 21 H.	Mar. 21 L.	Mar. 22 H.	Mar. 22 L.	Company.	Mar. 21 H.	Mar. 21 L.	Mar. 22 H.	Mar. 22 L.
Anaconda	.14	.12	.14	.12	Jack Pot	.08	.07	.08	.07
Cripple Ck Con.	.07	.05⅝	.07	.06⅝	Last Dollar	.45	.40	.45	.40
C. K. & N.	.19½	.19	.23⅞	.19¼	Mollie Gibson	.07	.05	.07	.05
Doctor-Jack Pot	.08	.06¾	.08¾	.06⅜	Moon Anchor	.09½	.08½	.09½	.08
Elkton Con	.66¾	.65¼	.68¼	.66¾	Old Gold	.09¾	.09⅜	.09¾	.09⅛
El Paso	.77½	.77	.77⅜	.77	Pharmacist	.04	.03¾	.04	.03¾
Gold Dollar Con.	.05⅜	.05⅛	.05⅜	.05⅛	Portland	1.80	1.70	1.80	1.70
Gold Sovereign	.04⅜	.04⅛	.04⅜	.04⅛	Vindicator	.65	.64	.66½	.60
Isabella	.28	.27½	.29	.28¼	Work	.06⅜	.06¼	.06½	.06⅛

SAN FRANCISCO.

Company.	Location.	Mar. 10 H.	Mar. 10 L.	Mar.11 H.	Mar.11 L.	Mar.12 H.	Mar.12 L.	Mar. 14 H.	Mar. 14 L.	Mar.15 H.	Mar.15 L.	Mar. 16 H.	Mar. 16 L.	Sales
Central Eureka	Cal													
Golconda	Ore.	.07												500
Golden Anchor	Nev.			.21	.20					.23				800
Hannapah	Nev.													
Lightner Mg. Co.	Nev.													
MacNamara	Nev.	.18						.21	.18	.20	.19	.20	.18	8,000
Mont. Tonopah	Nev.	1.22½	1.20	1.25	....	1.25	....	1.27½	1.25	1.25	....	1.25	....	4,560
Penna. C. M. Co.	Cal													
South Eureka	Cal													
Ton. Belmont	Nev.	.63	.59	.65	.60	.65	.62	.64	.62	.66	.62	.65	.59	15,588
Ton. Midway	Cal	.35		.40	.39	.41	.40	.39		.39		.39	.38	9,037
Ton. Mg. Co	Nev.			6.50						6.50	6.00	6.62½		700
Ton. North Star	Nev.							.32						200
Ton. & Salt Lake	Nev.													
Ton. Superior	Nev.													
Wild Goose	Ala.													

San Francisco and Tonopah Mining Exchange.
Total sales, 39,405 shares.

SAN FRANCISCO (By Telegraph).

Company.	March 21.	March 22.	Name of Company.	March 21.	March 22.
Belcher	.24	.25	Gould & Curry	.44	.43
Best & Belcher	2.40	2.35	Hale & Norcross	.87	.85
Caledonia	1.20	1.25	Mexican	1.95	1.90
Challenge Con	.33	.34	Ophir	5.00	4.95
Chollar	.22	.20	Overman	.25	.25
Confidence	1.00	1.00	Sierra Nevada	.68	.63
Con. California & Virginia	1.80	1.80	Union Con	.84	.82
Crown Point	.18	.18	Yellow Jacket	.35	.35

STOCK QUOTATIONS

MEXICO.* Mar. 11

Company.	Shares Issued.	Prices. Bid.	Ask.
Durango:			
Ca. Min. de Penoles..	2,500	$3,800	$4,100
San Andres de la Sierra	200	10,000	.....
Guanajuato:			
Angustias, Pozos....	2,400	48	52
Cinco Senores y An., aviadoras	2,000	45	55
Cinco Senores y An., aviada	400	45	55
Providencia, San Juan de la Luz	6,000	65	72
Queensland y Australia	300	55	75
Guerrero:			
Delfina, 1st serie....	2,500	52	55
Delfina, 2nd serie....	2,500	35	40
Garduno y Anexas...	7,200	30	40
Hidalgo:			
Amistad y Condordia	9,600	81	83
Carmen, aviada.....	1,100	50	90
Guadalupe Fresnillo Mill	1,000	170	200
Guadalupe Fresnillo Mine	1,400	70	80
La Blanca, aviadora.	1,538	.....	.....
La Blanca, aviada....	768	.....	.....
La Reina y An., aviadora	5,600	9	10
Luz de Maravillas, aviadas	1,100	.....	20
Maravillas y An., aviador	1,680	120	140
Maravillas el Lobo ..	1,000	130	180
Palma y An., aviador	1,800	14	18
Real del Monte.....	2,554	.....	.....
Refugio, aviada.....	12,800	1	5
Santa Anay An., aviadora	1,800	85	100
Santa Anay An., aviada	600	30	40
Sta. Gertrudis y An., aviadas	9,600	13	15
Sta. Gertrudis y An., aviadora	28,800	16	17
Santo Tomas Apostol aviadoras	5,100	2	3
San Felipe de Jesus, aviadora	3,600	16	17
San Felipe de Jesus, aviada	1,200	6	10
San Rafael y An., Trompillo	1,200	1,700	.....
San Rafael y An., aviada	1,200	650	670
Soledad, aviada.....	670	670	680
Sorpresa, aviada. ...	900	290	300
.....	.....	.....	.....

Name of Company.	Shares Issued.	Prices. Bid.	Ask.
Mexico:			
Alacran.....	2,400	20	28
Aldebarren.....	2,000	35	45
Buen Despacho.....	3,000	33	38
Dos Estrellas.....	3,000	1,520	1,580
La Esperanza (El Oro.).....	3,000	1,500	1,500
La Reformia, aviadores.....	2,000	20	25
Providencia, pagadoras.....	1,600	.....	.....
Providencia, liberadas.....	900	.....	.....
Santa Ana, Esperanza.....	2,400	90	.....
Michoacan:			
Luz de Borda, aviadora.....	3,000	60	65
Luz de Borda, aviado.....	1,000	38	40
Santiago y An., Tlal..	4,000	4	7
Nuevo Leon:			
La Fraternal.....	1,000	580	620
Norias de Bajan.....	1,000	880	920
San Luis Potosi:			
Concepcion y An.....	3,000	65	70
El Barreno, aviadora.	2,000	47	50
Sta. Maria de la Paz..	9,800	143	150
San Diegoy Annexas.	2,400	8	10
Zacatecas:			
Asturiana y An.....	2,500	20	30
Candelaria y Pinos..	2,500	130	140
Cubiertas.....	2,400	.....	.....
Esperanza y An.....	2,400	6	8
Lourdes.....	2,500	22	27
Luz de Minillas, pagadoras.....	2,000	15	30
Nueva Quebradilla, aviadoras.....	2,400	30	45
Nueva Quebradilla, aviadas.....	600	20	40
San Carlos y Annexas	2,500	55	60
Sta. Maria de Gaud..	2,500	60	70
Miscellaneous:			
Bartolome de Medina	2,000	78	81
Guadalupe Hacienda	20,000	.....	.....
La Luz Hac. (Pachuca.).....	3,750	.....	.....
La Reina (Chihuahua.)	192	.....	.....
Naica (Chihuahua.)..	100	11,000	13,000
Natividad (Oaxaca) aviadora	1,800	950	100
Natividad (Oaxaca) aviadas.....	600	.....	.....
San Francisco Hac...	6,000	64	70
Santa Ana Huantla Morelos.....	4,000	.....	.....
Union Hacienda.....	3,000	215	230

*Values are in Mexican currency.

TORONTO, ONT. March 19

Company.	Par val	Prices. High.	Low.	Sales
Black Tail, g.....	$1	.05	.02	.....
Cariboo-McKin	1	.03	.01	.....
Cariboo-Hydr.....	1	.70	.65	.....
Center Star, g. s....	1	.28	.25	.....
Crows Nest, C.C....	100	3.25	2.00	.....
Dominion Coal	100	.....	.....	.....
Dominion S. & I. ..	100	.....	.....	.....
Fairview, g. s.....	1	.03½	.02½	.....
Giant, g. s.....	1	.....	.....	.....
Deer Trail, g. s....	1	.02	.01	.....
Iron Mask, g. s....	1	.06	.05	.....
Morrison, g. s.....	1	.04	.01½	.....
.....	.....	.....	.....	.....

Company.	Par val	Prices. High.	Low.	Sales
Granby Smelter...	$10	4 20	3.50	.....
Mountain Lion, g.	1	.18	.11	.....
North Star, g. s...	1	.08	.....	.....
Nova Scotia Steel..	100	.....	.....	.....
Payne, s. l.....	1	.12	.05	.....
Rambler Carib ...	1	.35	.25	.....
Republic, g.....	1	.04	.02½	.....
St. Eugene, g. s...	1	.45	.30	.....
Virtue, g. s.....	1	.06	.....	.....
War Eagle Con....	1	.12	.09	.....
Sullivan, g. s.....	1	.05	.03	.....
Winnipeg, g. s....	1	.03¼	.03	.....
Wonderful, g. s..	1	.02½	.02	.....

g—Gold. l—Lead. s—Silver. Total sales, none.

SALT LAKE CITY.* March 19

Company	Par Val	High	Low	Sales.
Ajax	10	.05¼	.05	2,800
Butler Liberal.....	...	.10¾	.10½	2,500
Cariss.....	1	.....	.....	.....
Century	1	.78	.76	200
Con. Mercur...	1	.83	.81	2,300
Daly.....	20	.....	.....	.....
Daly-Judge	...	4.50	4.20	200
Daly West.. ..	½	32.25	31.00	675
Grand Central.....	...	4.10	4.00	500
Egl. & Blue Bell	...	.50	.50	500
Ingot	1	.01	.01	1,000
La Reine.....	¼	.06	.05	7,000
Little Chief	...	.04	.03	23,500
Little Bell.....	...	.....	.....	.....

Name of Company	Par Val	High	Low	Sales.
L. Mammoth..	½	38	.36¾	800
May Day.....	...	.06¼	.06	7,000
Mammoth.....	...	110	110	50
Martha Wash...	...	½	½	20,800
N. Y. Bonanza	5	.09¾	.09¼	5,300
Richmond, An.	...	.01½	.01	2,500
Sacramento....	1	.21	.21	500
Silver King	1	65.00	65.00	100
Star Con.....	...	.16¾	.15⅞	4,100
Tetro.....	...	.34	.32½	10,200
Uncle Sam, Con	1	.20	.19	2,300
Wabash	1	¾	¼	6,400
Yankee Con....	...	.52	.48½	3,800

*By our Special Correspondent. All mines are in Utah. Total sales, 103,025 shares.

PHILADELPHIA, PA.

Company.	Par val.	Mar. 16 H.	L.	Mar. 17 H.	L.	Mar. 18 H.	L.	Mar. 19 H.	L.	Mar. 21 H.	L.	Mar. 22 H.	L.	Sales
Am. Cement.	$10	7¼	.....	7⅛	7¼	7⅛	7⅛	.....	.....	7½	.....	.....	.....	169
Cambria Iron	50	46	.....	46	.....	46	.....	.....	.....	46	.....	46	45	660
Cambria Steel	50	19¾	.....	20½	19¾	20¾	20½	20¾	20⅝	20¾	20½	20⅝	20¼	5,715
Pa. Steel, pfd	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Susq. I. & S..	5	.....	.....	⅝	.....	¾	.....	.....	.....	¾	.....	.....	.....	825
United Gas I.	50	84	83	84	83¾	84⅛	84⅛	84⅝	84¼	84¾	84⅝	84½	84⅛	3,126
Lehigh Nav'p	50	67	66½	.....	.....	66¾	.....	.....	.....	67	.....	.....	.....	378
Philadelphia .	50	39⅛	39⅛	39⅛	39⅛	39¾	39¾	.....	.....	40⅛	40	40⅛	40	6,734
U.S. Steel.....	100	11¼	11⅛	11⅝	11⅛	11⅝	.....	11⅛	11⅜	11¾	11⅜	11⅛	11	7,125
U.S. Steel. pf.	100	57⅛	56⅞	58¼	57	58⅝	57¾	58¼	58¼	59	57⅜	58¾	57⅛	19,451

†Ex-Dividend Total sales 44,213.

LONDON. Mar. 11

Company.	Shares Issued.	Par value. £. s. d.	Latest dividend. Amt. s. d.	Date.	Quotations. Buyers. £ s. d.	Sellers. £ s. d.
American:						
*Alaska-Treadwell.....	200,000	5 0 0	1 6	Feb., 1904	4 10 0	4 15 0
Anaconda.....	1,200,000	5 0 0	2 0	Nov., 1903	3 3 9	3 6 3
Camp Bird.....	820,000	1 0 0	9	Feb., 1904	1 2 6	1 5 0
Copiapo.....	112,500	2 0 0	6 10	May, 1903	1 5 0	1 10 0
De Lamar.....	80,000	1 0 0	2 0	Oct., 1903	10 0	12 6
El Oro.....	1,080,000	1 0 0	9	Jan., 1904	1 1 3	1 3 9
Frontino & Bolivia.....	128,662	1 0 0	3 0	July, 1901	11 3	13 9
Le Roi.....	200,000	5 0 0	5 0	Nov., 1899	1 2 6	1 5 0
Le Roi No. 2.....	120,000	5 0 0	1 0	Feb. 1904	12 6	15 0
Montana.....	657,128	1 0 0	6	April, 1899	9	1 0
Standard.....	500,000	4 0	2½	Sept., 1903	2 6	3 6
Stratton Independence.	1,000,007	1 0 0	6	Dec., 1903	3 9	4 3
St. John del Rey.....	546,265	1 0 0	6	Dec., 1903	14 0	15 0
Tomboy.....	300,000	1 0 0	1 0	June, 1902	1 5 0	1 10 0
Utah.....	300,000	1 0 0	6 0	Jan., 1904	6 12 6	6 17 6
Ymir.....	200,000	1 0 0	1 0	Mar., 1902	1 3	3 9
European:						
Linares	15,000	3 0 0	5 0	Mar., 1904	3 5 0	3 15 0
Mason & Barry	185,172	1 0 0	11 0	May, 1903	3 12 6	3 17 6
Rio Tinto.....	325,000	5 0 0	32 6	Nov., 1903	47 15 0	48 0 0
Rio Tinto, preferred....	325,000	5 0 0	2 6	Nov., 1903	5 17 6	6 2 6
Tharsis.....	625,000	2 0 0	6 0	May, 1903	4 5 0	4 10 0
West Australian:						
Associated	495,388	1 0 0	2 0	Jan., 1904	2 13 9	2 16 3
Cosmopolitan.....	400,000	1 0 0	1 0	May, 1903	14 3	14 9
Golden Horseshoe.....	300,000	5 0 0	6 0	Apr., 1904	8 10 0	8 12 6
Great Boulder.....	1,750,000	2 0	9	Mar., 1904	1 6 9	1 7 3
Great Boulder Persvrce	1,400,007	1 0 0	1 3	Feb., 1904	1 3 9	1 6 3
Great Fingall.....	250,000	1 0 0	8 0	Jan., 1904	8 11 3	8 13 9
Ivanhoe.....	200,000	5 0 0	5 0	Jan., 1904	5 11 3	8 13 9
Kalgurli.....	120,000	1 0 0	2 6	Apr., 1904	5 11 3	5 13 9
Lake View	250,000	1 0 0	rts.	Aug., 1902	1 2 6	1 5 0
Oroya-Brownhill	450,000	1 0 0	2 6	Mar., 1904	3 16 3	3 18 9
Miscellaneous:						
Brilliant Central	100,000	1 0 0	1 0	Mar., 1904	2 15 0	3 0 0
Briseis	600,000	1 0 0	...	.....	5 6	6 6
Broken Hill.....	960,000	8 0	1 6	Feb., 1904	1 9 0	1 10 0
Mt. Lyell	275,000	3 0 0	4 3	Sept., 1903	15 6	16 6
*Mt. Morgan.....	1,000,000	1 0 0	3	Mar , 1904	1 16 3	1 18 9
*Waihi.....	487,412	1 0 0	2 6	Mar., 1904	4 18 9	5 1 3
Indian:						
Champion Reef.....	513,832	10 0	6 6	Jan., 1904	1 14 6	1 15 6
*Mysore.....	566,043	10 0	5 6	Mar., 1904	6 8 9	6 11 3
Nundydroog.....	484,000	10 0	1 8	Apr., 1904	2 1 3	2 3 9
Ooregum	343,000	10 0	9	Dec., 1903	1 0 0	1 2 6
Ooregum, pfd.....	240,000	10 0	1 9	Dec., 1903	1 7 6	1 10 0
South African:						
Angelo.....	600,000	1 0 0	4 0	Feb., 1904	6 0 0	6 5 0
*Bonanza.....	200,000	1 0 0	10 0	Feb., 1904	1 18 3	1 18 9
British South Africa....	4,436,019	1 0 0	rts.	May, 1899	1 11 3	1 12 6
Cape Copper.....	300,000	2 0 0	4 0	Jan., 1904	2 7 6	2 12 6
Cape Copper, pfd.....	75,000	2 0 0	1 9	Jan., 1904	2 15 0	3 0 0
*City & Suburban	340,000	4 0 0	8 0	Feb., 1904	6 0 0	6 5 0
Consol. Gold-Fields.....	2,000,000	1 0 0	...	.....	5 8 3	5 8 9
Crown Reef.....	120,000	1 0 0	20 0	Oct., 1903	15 0 0	15 10 0
De Beers, preferred....	800,000	2 10 0	10 0	Jan., 1904	18 11 3	18 13 9
De Beers, deferred.....	1,000,000	2 10 0	15 0	Jan., 1904	19 2 6	19 5 0
East Rand.....	960,000	1 0 0	5 0	Aug., 1903	5 18 9	6 0 0
Ferreira.....	90,000	1 0 0	3 0	ay, 1904	18 5 0	18 15 0
Heldenhuis	200,000	1 0 0	6 0	Feb., 1904	4 17 6	5 2 6
Jeduld.....	400,000	1 0 0	rts.	Mar., 1902	5 2 6	5 3 9
Henry Nourse.....	125,000	1 0 0	10 0	Feb., 1904	8 0 0	8 5 0
Jubilee.....	50,000	1 0 0	5 0	Feb., 1904	3 10 0	3 15 0
Jumpers.....	100,000	1 0 0	2 6	Mar., 1904	2 10 0	2 15 0
Langlaagte.....	470,000	1 0 0	2 6	Feb., 1904	3 2 6	3 5 0
May.....	288,750	1 0 0	3 6	Feb., 1904	3 15 0	3 17 6
Meyer & Charlton.....	100,000	1 0 0	5 0	Jan., 1904	4 12 6	4 17 6
Modderfontein	290,000	1 0 0	rts.	Apr., 1902	6 17 6	7 0 0
Namaqua	94,331	2 0 0	3 0	Dec., 1903	2 17 6	3 2 6
New Jagersfontein..	200,000	5 0 0	10 0	Dec., 1903	27 15 0	28 5 0
New Primrose.....	325,000	1 0 0	3 0	Mar., 1904	3 10 0	3 12 6
Rand.....	1,795,956	5 0	4 0	Aug., 1902	8 12 6	8 13 9
Robinson	750,000	5 0 0	5 6	Feb., 1904	9 0 0	5 5 0
Robinson Deep.....	950,000	1 0 0	3 0	Jan., 1904	4 16 3	4 18 9
Rose Deep	425,000	1 0 0	2 6	Feb., 1904	7 0 0	7 5 0
Salisbury	100,000	1 0 0	2 0	Mar , 1899	1 10 0	1 12 6
Village.....	400,000	1 0 0	3 0	Feb., 1904	6 0 0	6 5 0
Wemmer	80,000	1 0 0	10 0	Jan., 1904	9 10 0	10 0 0

*Ex-dividend.

LONDON (By Cable.)*

Company.	Mar. 16 £. s. d.	Mar. 23 £. s. d.	Company.	Mar. 16 £. s. d.	Mar. 23 £. s. d.
Anaconda.....	3 7 6	3 10 0	El Oro.....	1 2 6	1 2 6
British So. Africa.	1 13 9	1 12 6	Modderfontein....	6 16 7½	6 9 4½
Camp Bird.....	1 4 4½	1 4 9	Rand Mines.....	9 7 6	9 3 6
Con. Gold Fields.	5 17 6	5 12 6	Rio Tinto	49 5 0	50 8 9
De Beers.....	19 15 0	19 10 0	Simmer & Jack...	1 8 1½	1 9 4½
East Rand.....	6 7 6	6 4 4½	Tomboy.....	1 8 1½	1 8 9

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. Mar. 3

Company.	Location.	Capital Stock. Francs.	Par value. Fr.	Latest divs. Fr.	Prices. Opening. Fr.	Closing. Fr.
Anzin, Coal.....	France	.....	290.00	5,500.00	5,275.00	
Boleo, c.....	Lower Cal....	12,000,000	500	62.50	1,695.00	1,652.00
Champ d'Or, g.....	S. Africa.....	3,375,000	25	3.75	18.00	18.00
Courrieres, Coal.....	France	600,000	500	110.00	2,650.00	2,650.00
Fraser River, g.....	Brit. Col....	250,000	25	.....	5.50	5.50
Huanchaca, s.....	Bolivia.....	40,000,000	125	2.50	66.00	62.75
Laurium, z. l....	Greece.....	16,300,000	500	25.00	315.00	312.50
Malfidano, z.....	Italy	12,500,000	500	50.00	570.00	580.00
Metaux, Cie. Fran. de.....	France	25,000,000	500	22.50	456.00	455.00
Mokta-el-Hadid, i. l.....	Algeria	18,312,000	500	40.00	825.00	800.00
Nickel, n.....	N. Caledonia..	15,000,000	250	22.50	500.00	500.00
Penarroya, Coal	Spain.....	.....	500	45.00	1,042.00	1,014.00
Vielle Montagne z.....	Belgium..	9,000,000	30	30.00	670.00	674.00
Wyoming, o.....	Wyoming.....	.....	25	.....	357.00	357.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.

ST. LOUIS, MO.* March 19

Name.	Par Val.	Prices. Bid.	Ask.	Name.	Par Val.	Prices. Bid.	Ask.
Am.-Nettie, Colo....	$10	$0.15	$0.25	Columbia Lead, Mo.	$10	$3.50	$4.50
Catherine Lead, Mo.	10	1.40	2.00	Con. Coal, Ill.....	100	16.00	18.00
Central Coal & C....	100	59.25	62.25	Doe Run Lead Mo.	100	110.00	115.00
Central C. & C., pf..	100	70.00	71.00	Granite Bimet. Mt..	10	.35	.45
Central Lead, Mo...	100	110.00	115.00	St. Joe Lead, Mo,...	10	14.50	16.00

*By our Special Correspondent.